VOL.

AVIATION WEEK

FEB. 28, 1949

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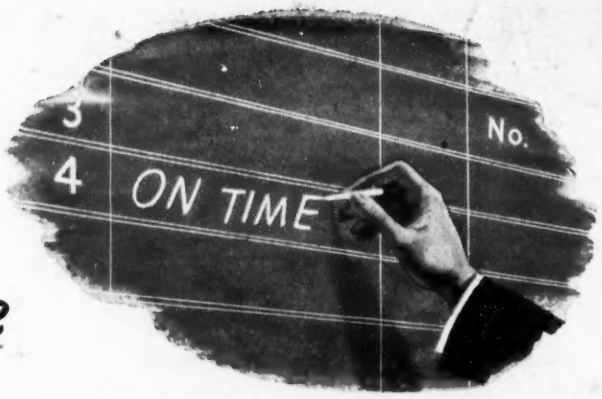

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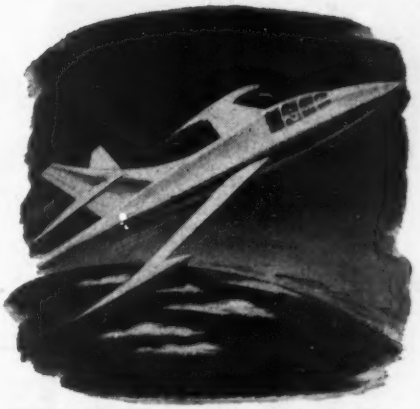
▸ A small-scale model of a ram jet inlet is mounted in Wright's supersonic wind tunnel. As the air flows at mach No. 2 (twice the speed of sound) through the tunnel, *schlieren* apparatus—an optical instrument—accurately photographs the influence of the jet's body lines upon the flow pattern of the air. The oblique lines in picture represent shock waves created by impact of body on air.

▸ These *schlieren* pictures provide valuable new data on the phenomenon of compressibility—a condition that exists at the speeds attained by jet and rocket propelled aircraft and guided missiles.

▸ From them, Wright design engineers can determine the most efficient passage shapes for ram jets and other types of supersonic power plants.

▸ Another example of the integrated research that enables Wright Aeronautical to provide better power plants for the aviation industry.



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AVIATION WEEK

February 28, 1949

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Aviation Week is indexed in "Reader's Guide to Periodical Literature", "Engineering Index" and "Industrial Arts Index". Publications combined with AVIATION WEEK are: AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL.

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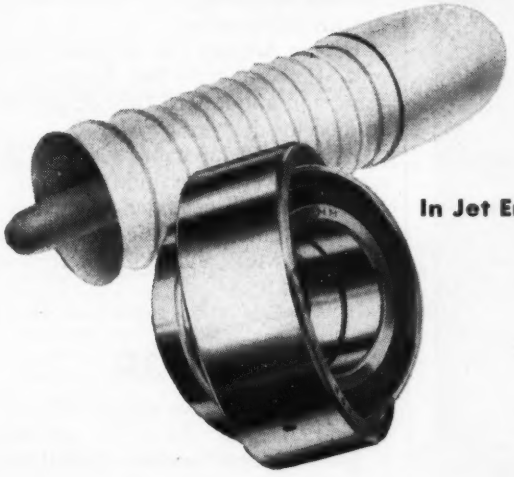

In Jet Engines

In Propellers

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NEWS DIGEST

DOMESTIC

Merger talks reportedly have taken place between Peruvian International Airlines and TWA, but Danzil R. A. Walker, president of PIA, claims "no deal. . . has been closed with anybody." Walker succeeded Lt. Gen. Harold George (Ret.) as head of the Peruvian flag-carrier. George is now vice president and general manager of Hughes Aircraft Co.

Flader-Clark Corp. has been formed, tieing research facilities of Frederic Flader, Inc., North Tonawanda, N. Y., and Clark Bros. Co., Inc., Olean, N. Y., a division of Dresser Industries, Cleveland. New firm will apply to industrial turbines axial flow compressor principles developed in aircraft gas turbines.

Walford F. Schanz, former executive plane pilot, has been appointed Florida aviation supervisor, succeeding William Lazarus, who resigned without announcing his future plans.

Boeing Aircraft Co. delivered its second Stratocruiser to Pan American Airways, and announced two are are being readied for delivery by Mar. 5.

Aviation Maintenance Corp.'s USAF contract-covering reconditioning of 47 C-47s has been extended to include 36 additional aircraft. Basic work is being done at AMC's Van Nuys, Calif., service center.

FINANCIAL

Pioneer Air Lines reports net profit of $119,532 for its 1948 operations, making an overall profit of $8900 for 41 months of operation.

TWA has filed a registration statement with SEC, offering 404,112 shares of common stock to stockholders at the rate of $10 per common share for each five shares held. Hughes Tool Co., holder of 1,486,523 shares, has agreed to purchase 297,304 shares of the total offering.

FOREIGN

P. A. Cumyn, chief of ICAO's administrative bureau, announced his resignation effective July 1. Member states of ICAO are being asked to submit nominees for his successor.

BOAC contract with Canadair for 22 four-engine, 40-passenger planes, presumably Canadair Fours, will be for $17 million. Canadair's contract with Canadian Pacific Airlines is for $3 million, to supply three of the 36-passenger four-engine transports.

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Length (less shaft)—2⅞₆ inches
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Standard shaft diameter—¼ inch
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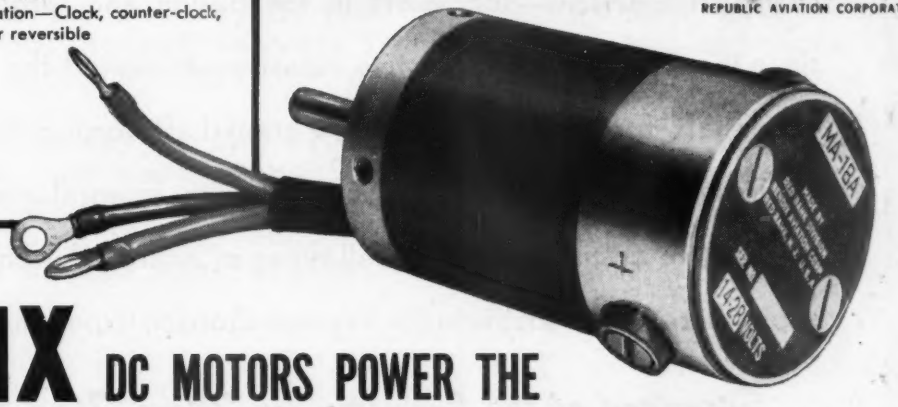

BENDIX DC MOTORS POWER THE TRIM-TAB ACTUATORS IN THE REPUBLIC F-84 "THUNDERJET"

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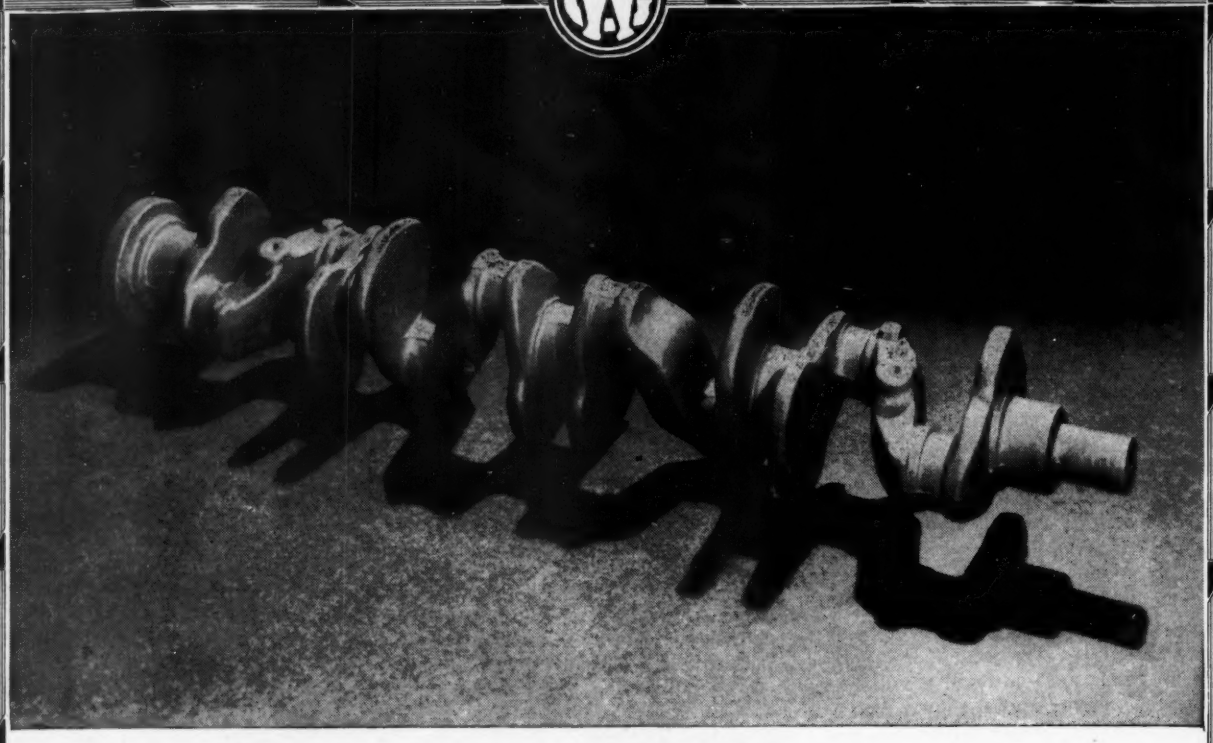

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AVIATION WEEK

THE SECRETARY OF DEFENSE
WASHINGTON

THE ROLE OF U.S. AIR POWER

Air power has become one of the great instruments of military strength. In our own country that power has to be viewed not merely in terms of the Air Force alone or of Naval Aviation alone, but in terms of the total air power of the United States. That this power has now reached maturity and is aware of its relationship to other forces is amply evidenced by the fact that the military heads of our services are in unanimous agreement that the security of our nation depends upon a proper combination and employment of land, sea and air teams.

As for the future, no man can predict with accuracy the exact specifications for security, but whatever they may be, air power will be required.

Whatever may be the evolution of military power of the future, the best guarantee for universal peace is to have the most potent force in the hands of the most peaceful nation. To that end, and with no unbalance of economy, this nation must strive.

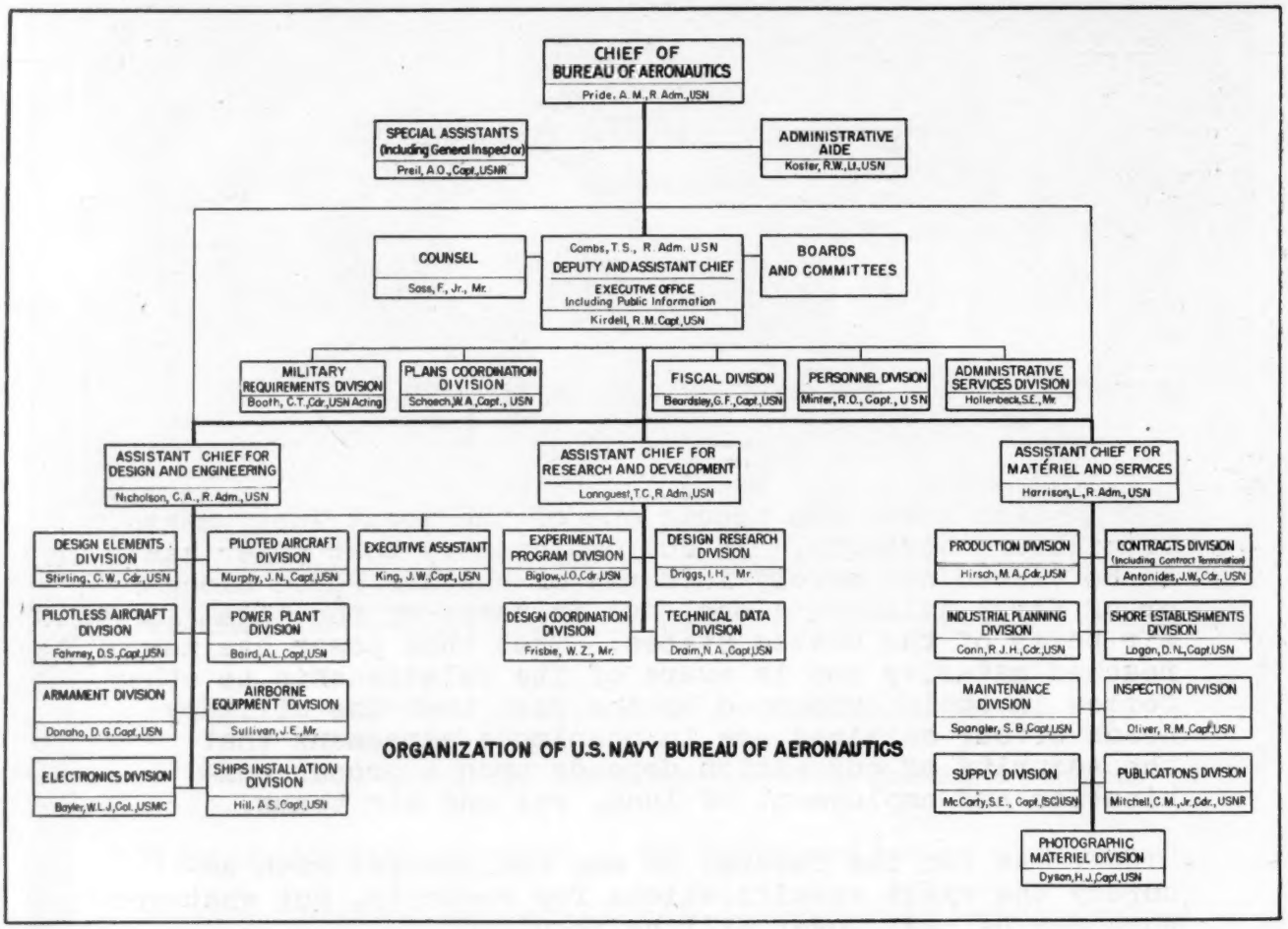
James Forrestal

THIS is AVIATION WEEK's *second Inventory of U. S. Air Power, the 16th successive Yearbook.*

As Secretary of Defense James Forrestal points out in the above statement which he wrote especially for this issue of AVIATION WEEK, *air power is the total air resources of the United States.*

The job of strengthening those resources began last summer with the largest peacetime aviation appropriations in our history. This is a progress report.

But to judge the effectiveness of the U. S. air power, the air potential of other countries must be examined. Accordingly, McGraw-Hill World News correspondents report on aircraft and air power of principal foreign nations.



ORGANIZATION OF U.S. NAVY BUREAU OF AERONAUTICS

Air Power: America's First Line of Defense

With manufacturing reviving and service differences dwindling, U. S. air power prepares for world role.

By Robert Hotz

American air power is emerging as the most significant force in the postwar world.

Defense Secretary James Vincent Forrestal has indicated that within five years American air power may assume the role that was played by British sea power during the last century. Some observers believe that Forrestal's estimate may be conservative in its time element.

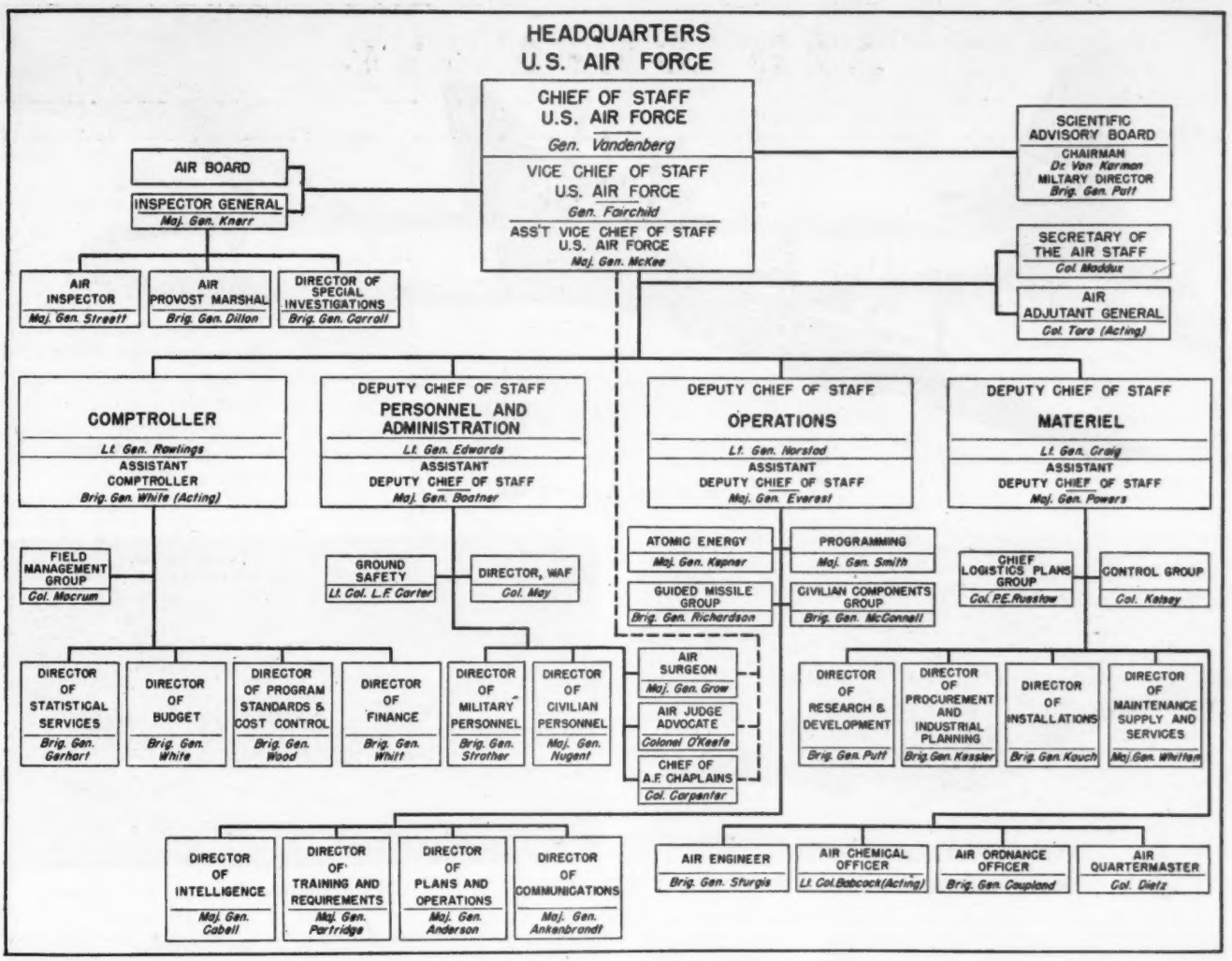
▶ **Air Power First**—There is no longer much opposition to the thesis that air power has replaced sea power as America's first line of defense. How soon this thesis is implemented with the means to provide an adequate force capable of playing the role will depend first, on Congressional action in providing the funds required for the development and production of adequate air power; second, on the ability of the industry to produce the planes necessary; and third, on the skill of the military services in applying this equipment to the specific tactical and strategic problems confronting us as a nation.

There has been little change in the combat strength of U. S. air power during the past year. Total combat planes in operation numbered 11,500 as of Jan. 1, 1949, compared with 11,705 a year ago. Of these, 6000 are Navy planes and 5500 belong to USAF. In addition there is a combat plane reserve of 7183 planes (2183 Navy and 5000 USAF) with a support force of 16,814 trainers, transports and utility types. This makes total U. S. military air power number 35,497 planes (24,000 USAF and 11,497 Navy).

Technical Progress—Real progress has been made however in rehabilitating the industrial base which produces the planes required and in equipping both USAF and Naval Aviation with modern postwar types. Total of 2400 military planes with an airframe weight of 25 million lb. were manufactured in 1948 compared with 2100 planes and 11,400,000 airframe lb. in 1947. Both USAF and Navy now have numerous jet fighter groups compared with only a few a year ago.

Best estimates available now indicate that the USAF will operate at a strength of 57 combat groups during 1949 against its measure of 70 groups as the minimum peacetime defense requirement. Navy will have about 7000 planes compared with the 14,500 plane goal set for its peacetime minimum.

▶ **Bulk to Air Force**—Recent trend on Capitol Hill indicates that the bulk of the air power budget will be invested in the U. S. Air Force with Naval Aviation



playing a subordinate role. As USAF continues its heavy emphasis on development of strategic air power there is some evidence that the Navy may specialize in developing the elements of tactical air power in addition to its primary responsibility for anti-submarine warfare.

There is also evidence that the old and sharp division between the services regarding their respective air elements may be dissolving in a new outlook that will view all of the elements available in terms of total air power. Merger of transport services in the Military Air Transport Service, with both Air Force and Navy personnel working in a common air operation, is an example of how this view may be translated into practical terms. Similar applications in the field of aviation training and tactical air power may be in prospect. Another trend will be toward common education.

While tremendous technical progress has pushed performance up to levels only dreamed of in the immediate postwar period there has not been comparable progress in the tactical application of these performance powers. Considerable effort will be devoted along this line in the immediate future.

USAF Builds Intercontinental Force

Activation of B-36 groups, plus refueling techniques, increase striking range and cause shift in emphasis.

In its second year as an independent organization within the National Military Establishment, the U. S. Air Force is placing its principal emphasis on the exercise of strategic air power through the intercontinental bomber.

Biggest event of the year was organization of two full combat groups (36 planes) of Convair B-36 bombers and the debut on the production line of the B-36B, the first fully-armed version of the six-engine intercontinental bomber to roll out of Convair's Ft. Worth assembly plant.

► **B-50 Refueling**—Of almost equal significance was the modification of war surplus Boeing B-29s as aerial tankers for air-to-air refueling and the incorporation of B-29 tankers in tactical units of the Strategic Air Command. Use of the tankers will permit the Boeing B-50 bomber to be used in intercontinental operations as a stablemate of the B-36.

A third intercontinental bomber type

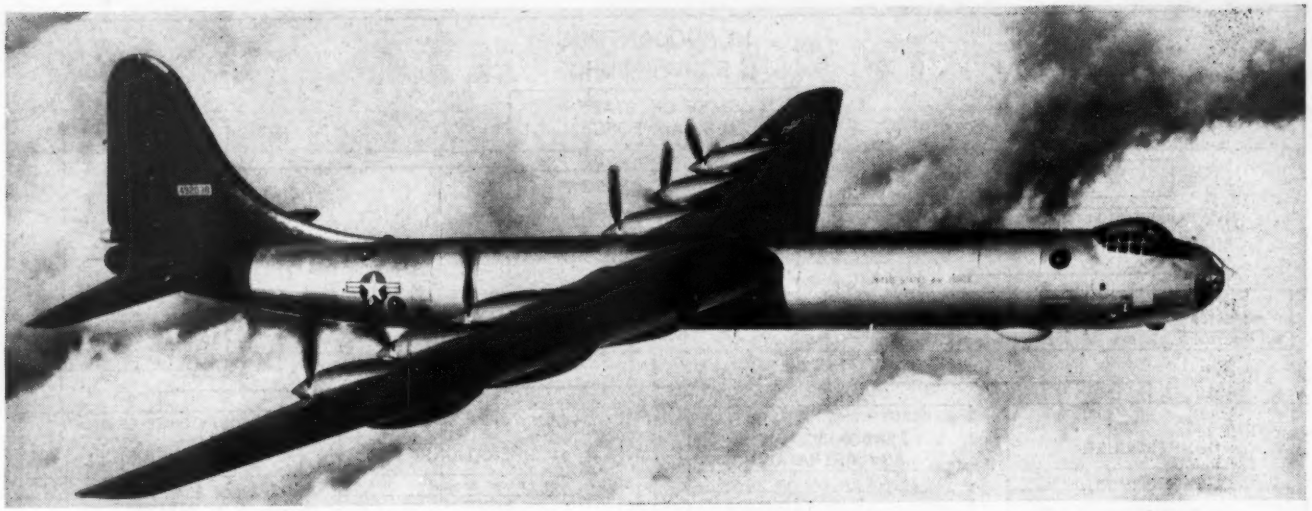
Naval Air Strength

Combat types operational—USN.	6,000
Combat types operational—USNR	2,183
Logistical support (USN, USNR) (includes pipeline, overhaul and storage)	3,314
TOTAL	11,497

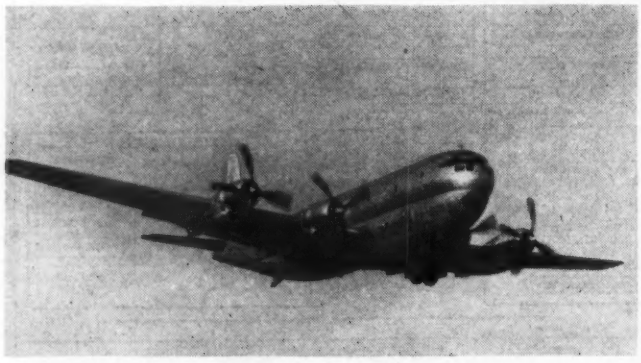
USAF Strength

Active combat types	5,500
Inactive combat types (storage)	5,000
Active utility types	7,500
Inactive utility types	6,000
TOTAL	24,000

As of Jan. 1, 1949.



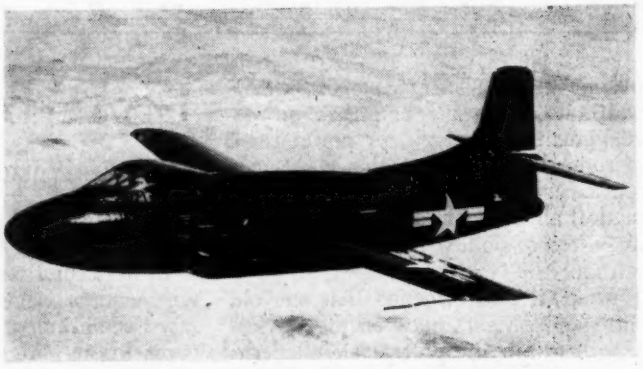
Consolidated Vultee B-36B



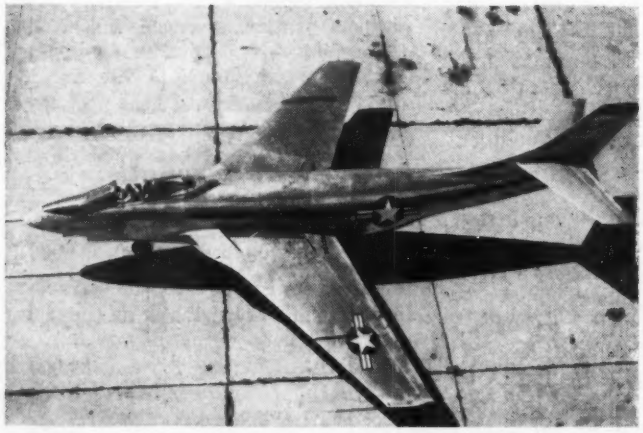
Boeing YC-97A Stratofreighter

North American B-45

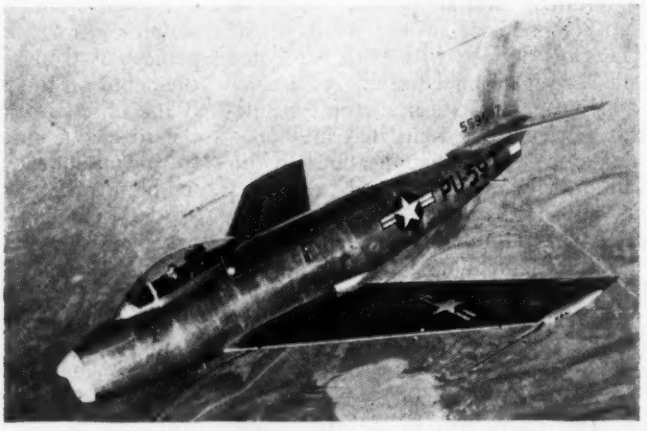
North American XAJ-1



Douglas XF3D-1 Skyknight



McDonnell F-88 Voodoo



North American F-86

is on the experimental horizon and may have a prototype flying before the end of 1949. It will be capable of ranges comparable to the B-36 without refueling and at higher speeds.

▶**Kenney vs. LeMay**—Much of the emphasis on the intercontinental bomber in current USAF activities can be traced to the shift of Lieut. Gen. Curtis LeMay to replace Gen. George Kenney, as commander of the Strategic Air Command. Kenney's plans were based on the development of a bomber capable of speeds around Mach 1 with a range of about 6000 miles and utilizing advance foreign bases from which to strike the enemy. LeMay is the champion of the intercontinental bomber that is now represented by the B-36 and presumably will use altitude, bad weather and emergency speed boosts to evade enemy defenses.

Recent USAF decision to buy 39 more B-36s in addition to the 95 now on order is a reflection of the LeMay viewpoint. Convair has recently sold USAF a project to equip all of the 134 B-36s built or on order with four jet engines slung in external nacelles under each wingtip.

These jet engines, which would be used for emergency power on takeoff or for evading enemy defenses, are in addition to the six Pratt & Whitney 3500 hp. Wasp Major piston pusher engines used for normal cruising that now are installed.

▶**Striking Force**—Building on the firm operational foundation laid during Kenney's command of SAC, LeMay is building a mobile long range striking force capable of hitting targets almost anywhere in the world from North American bases. Carrying atomic weapons, the relatively small numbers of this long range striking force can deliver the destructive weight of an attack that formerly required mass formations of more than a hundred times their present numbers.

Existence of this long range striking force is probably the most significant element of American air power today. While its capabilities to carry out announced objectives may be seriously questioned, no foreign power would gamble its own cities in a test of those capabilities without the most compelling motives.

▶**Tactical Cuts**—While Strategic Air Command is rapidly approaching its full strength of 20 bomb groups plus strategic reconnaissance and defensive fighter strength, and is getting the lion's share of USAF money both in procurement and operational funds, tactical air power is languishing even by the most optimistic view. Strategic air power is, by Joint Chief of Staff edict, primary responsibility of USAF. This has caused procurement shifts.

With a Presidential-order cut from

USAF Requirements for 70-Group Regular Air Force

(plus 22 special squadrons)

Plane Type	No. of Groups	Number of Planes
Heavy Bomber (B-36)	4	95
Strategic Recon (RB-36)	1	40
Medium Bomber (B-29, B-50, B-54)	16	695
Medium Recon (B-50, RB-54)	5	158
Light Bomber (B-45, B-47)	5	436
Fighters:		
Interceptor (F-80, F-84, F-86)	22	1,898
All Weather (F-89, F-94)	3	135
Tactical Recon (F-80)	4	165
Transports:		
Heavy (C-124)	4	417
Medium (C-119)	4	463
Light (C-125, C-122)	2	56
Amphibian (SA-16)	..	67
Liaison (L-16, L-17)	..	310
Helicopters	..	105
Trainers:		
Primary-Basic (T-31, T-28)	..	1,107
Advanced single engine (TF-80)	..	336
Advanced twin-engine (T-29)	..	396
TOTAL Regular AF	**70**	**6,879**
Air Reserve	34	2,360
Air National Guard	27	3,212
TOTAL RESERVE AF	**61**	**5,572**
Storage Pool (to replace initial control losses)		8,100
TOTAL PLANES REQUIRED		**20,551**

Service Plane Designations

The rapidly-changing missions and technology of the Air Force and Naval Aviation require accompanying changes in aircraft designations although the principle of both systems is the same.

Following systems are in present use:

▶**Air Force**—Air Force designates the mission, type and model number of its aircraft by the following letters: **B**, bombardment; **C**, cargo; **F**, fighter; **H**, helicopter; **L**, liaison; **R**, reconnaissance; **S**, search; **T**, trainer; and **X**, research. In addition, **A**, amphibian, is used as a prefix to other mission designations but not alone. These letters are also used in combination to indicate dual missions, such as: **TF**, trainer-fighter; **SA**, search-amphibian; **RB**, reconnaissance-bombardment; and **LC**, liaison-cargo.

Prototypes are designated by an X prefix and production models by alphabetical suffixes, such as F-80A, F-80B, F-80C, etc. Suffix letters normally indicate a lack of complete interchangeability of parts, usually the engine, or changes which affect the performance, maintenance or tactical use of the airplane.

▶**Navy**—The Navy designation system is similar except that a manufacturer's identifying letter is added as well as detailed suffixes indicating special missions. Navy aircraft type designations are: **VA**, attack; **VF**, fighter; **VH**, helicopter; **VP**, search; **VT**, trainer; and **VR**, transport.

Currently active aircraft manufacturers are identified as follows: **B**, Beech, Boeing; **C**, Curtiss; **D**, Douglas; **E**, Piper; **F**, Grumman; **G**, Goodyear; **H**, McDonnell; **J**, North American; **M**, Martin; **O**, Lockheed; **Q**, Fairchild; **R**, Ryan; **S**, Sikorsky; **U**, Chance Vought; **Y**, Convair.

In addition, a large number of suffixes are used to indicate special modifications to otherwise standard aircraft types: **A**, amphibian; **B**, special armament; **C**, carrier version of non-carrier aircraft; **D**, drone control; **E**, special electronic gear; **G**, search and rescue; **H**, hospital; **J**, target tow; **K**, target drone; **L**, searchlight; **M**, weather reconnaissance; **N**, night operating aircraft; **P**, photographic; **Q**, countermeasures equipment; **R**, transport; **S**, anti-submarine warfare equipment; **T**, training; **U**, utility; **W**, special search; **Z**, administrative.

Navy combines these numerals and letters to indicate separate types and models by designating the first numeral as the model designation and the second numeral as changes in the same model.

66 group strength to 48 groups it was not surprising that tactical air power suffered more than the strategic arm and there are good reasons why this priority may be valid. However there is a growing concern, particularly from the Army, over the lack of substantial progress in the tactical fields.

▶ **Jet Transition**—Transition of USAF fighter groups to jet-powered planes is nearing completion with 15 jet fighter groups now in operation and four National Guard groups now being equipped with jet fighters. Types currently in squadron use include the Lockheed F-80 series, Republic F-86 series and the North American F-86A.

North American's B-45 four-jet bomber is the only light bomber currently in production. USAF has been eyeing the Navy's Douglas AD attack planes series as a possibility to bolster the attack force of its tactical air power. Boeing's B-47 six-jet bomber would be considered a light bomber in its present form but will be part of the Strategic Air Command's bomber force in its later versions.

Night fighters are still a big gap in the USAF arsenal with only the F-61 and F-82, both piston powered, in operation and no entirely satisfactory jet night fighter even in experimental models. Emphasis on development of a satisfactory night fighter will be evident during the coming year.

Projected Naval Air Program
(including reserves)

Combat	
Fighters (F4U, F8F, F2H, F7U)	3,990
Attack (AD-1, 2, 3, 4, AM-1, AJ-1)	1,972
Patrol-land based (P2V, P4M)	598
Patrol-sea based (PBM, P5Y)	194
Patrol-amphibian (PBM-5A)	65
TOTAL COMBAT	**6,819**
Noncombat	
Transport (heavy)	94
Transport (medium)	307
Utility (single engine)	129
Utility (multi-engine)	512
Training (single engine)	1,922
Training (multi-engine)	715
Helicopters	189
TOTAL NONCOMBAT	**3,868**
TOTAL OPERATING AIRCRAFT	**10,687**
Logistic support (pipeline overhaul, etc.)	3,887
TOTAL PLANES	**14,474**

New Navy Planes Hint New Tactics

Future carrier force to be built around high speed, far-ranging craft whose prototypes now are flying.

Naval Aviation made significant experimental strides in speed and range during 1948 while continuing its slow but steady transition from piston engine types of jet powered planes.

Most significant new naval planes of the year were the North American XAJ-1, a carrier-based attack bomber powered by two piston engines and one turbojet, and the Chance Vought XF7U-1, a twin jet tailless fighter featuring low aspect ratio and sweptback wings. Both mark the beginning of a new kind of ship-based aviation that is the Navy's long term goal. This goal is a fast, mobile carrier task force with planes operating in the transonic speed range and striking at targets up to 2000 miles from their floating bases.

▶ **Piston Force**—Present Naval carrier aviation is capable of hitting targets at a maximum range of about 800 miles from the carriers. This force consists primarily of Douglas AD series and Martin AM series attack planes with Grumman F8F and Chance Vought F4U-5 fighters—all piston powered engines. Fighter types of this force are already in transition to jet-powered McDonnell F2H Banshees and Grumman F9F Panthers but this will increase only speed and if anything reduce range slightly.

The XAJ-1, with its combination of piston power for cruising augmented by jet thrust for high speed in the target area, will boost the range of Navy carrier aviation out to a 1200 mile radius from its carriers. Similarly, the XF7U-1 will boost Navy fighter speeds into the supersonic at altitude and make them comparable to the best land-based fighters now flying.

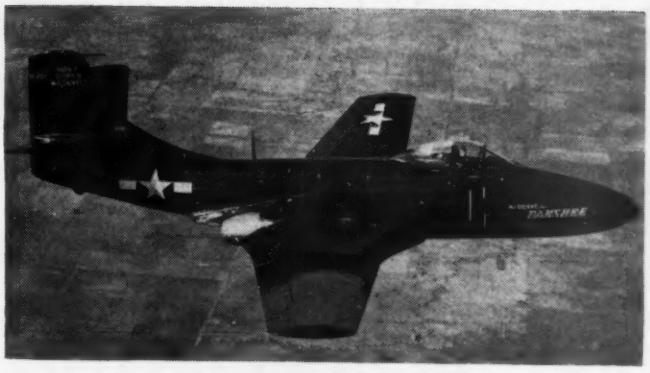
▶ **Third Step**—Third step will see the production of a carrier-based bomber that will be similar roughly in basic design, performance and weight to improved versions of the USAF's XB-47. This new Navy attack type is now in a design competition with entries from most of the major airframe manufacturers.

The design finally selected for prototype construction will extend the Navy's aerial range to a 2000-mile circle from the carrier, which, the Navy believes, will include every significant land target in the world. Fighter development in this phase will be along the same lines of supersonic performance already evident in the basic design of the Chance Vought XF7U-1.

▶ **Ultimate Goal**—This is the Navy's ultimate goal with these planes operating from 65,000-ton flush deck supercarriers of which the USS United States is the prototype. When naval air development reaches this stage it is likely that even as planes are now specialized for a specific purpose so will the carriers be divided along functional lines. Long range bombers will operate from the big supercarriers behind a fighter screen and escorts will operate from smaller and faster ships under new tactical developments.

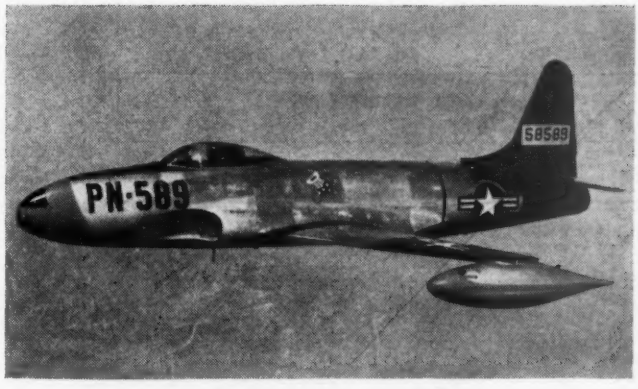
Plans for a water-based naval air force to supplement the carrier striking forces are still in the early experimental stages. First prototypes are scheduled for flight testing during 1949. They will be Convair's P5Y flying boat, featuring a new type long slim hull, and the Convair Skate, a flying boat fighter.

▶ **Current Strength Cut**—Navy's current air strength will be reduced from about 8000 planes to 7000, or about half of the 14,500 plane strength that is Navy's long term air goal. As congressional sentiment continues to favor the largest share of air power budget for the U. S. Air Force it is likely that Naval Aviation will concentrate more on developing advanced prototypes and service test quantities of aircraft to prove the practicability of its theories rather than embarking on any large scale production program of tactical types similar to the build-up to 70 modernized combat groups which was begun by the Air Force last year.

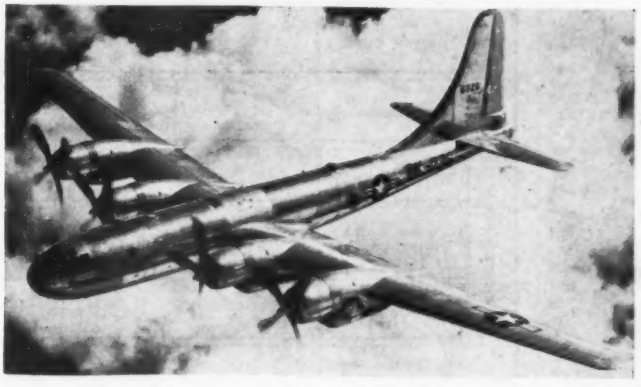


McDonnell F2D-1 Banshee

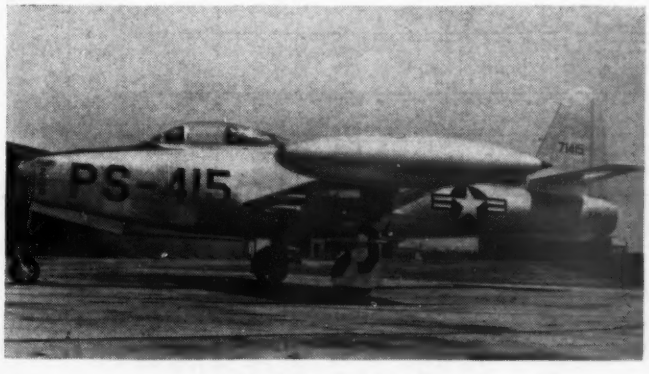
Grumman F9F-3 Panther



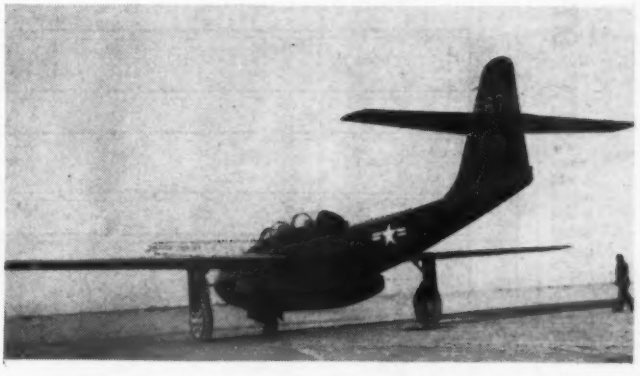
Lockheed F-80B Shooting Star



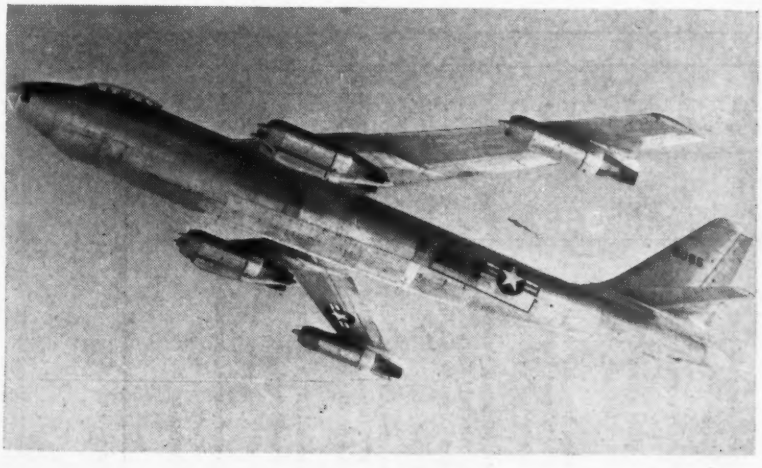
Boeing B-50A



Republic F-84 Thunderjet



Northrop XF-89 Scorpion



Boeing XB-47 Stratojet

Chance Vought XF7U-1 Cutlass

U. S. Military and Naval Aircraft

Manufacturer	Designation	Type	Crew	Cargo or bomb load, lb.	Powerplant: Number and make of engines	Powerplant: Max. hp. or lb. thrust	Powerplant: At rpm.	Powerplant: Normal rated hp.	Powerplant: At rpm.	Powerplant: At altitude, ft.	Powerplant: Fuel capacity, gal.	Performance: Max. speed, mph.	Performance: At altitude, ft.	Performance: Service ceiling, ft.	Performance: Rate-of-climb, ft. per min.	Weights: Gross weight, lb.	Weights: Empty weight, lb.	Dimensions: Span, ft., in.	Dimensions: Length, ft., in.	Dimensions: Height, ft., in.	Current orders	Remarks
Aeronca Aircraft Corp. Municipal Airport Middletown, Ohio	L16B	Liaison	2	.....	C., C90-8FJ	90	2350	90	2350	S.L.	18.5	100	S.L.	.....	870	1300	809	35′	21′	5′ 6″	537	AGF. Nat. Guard
Beech Aircraft Corp. Wichita, Kans.	45	Trainer	2	.....	C.	185	*2300*	.....	.....	*S.L.*	.....	176	S.L.	.....	925	2650	*1770*	*32′ 10″*	*25′ 2″*	.....	....	*Comcl. trainer competition*
Boeing Airplane Co.	XB-47	Bomber	3	*22,000*	6 G.E. J-35	4000	*7600*	.....	.....	.....	*15,000*	*630*	*35,000*	*38,000*	*4800*	125,000	.....	116′	108′	28′	....	Swept wing; transcntl. record
Box 3107	B-50A	Bomber	11	*20,000*	4 P&W R-4360	3500	2700	.....	.....	.....	*10,000*	*385*	*30,000*	30,000	*1800*	140,000	*80,000*	141′	99′	32′ 11″	345	3 hr. 46 min.
Seattle 14, Wash.	YL-15	Liaison	2	.....	Ly. 0-290-7	125	*2600*	.....	.....	*S.L.*	21	104	S.L.	15,000	615	2111	1568	40′	25′ 10″	8′ 2″	....	Improved B-29
Cessna Aircraft Co. Wichita, Kans.	LC-126	*Liaison*	...	.....	*Ja. R-755*	*300*	*2200*	.....	.....	*S.L.*	.....	*180*	*7000*	.....	*1200*	*3350*	*2050*	*36′ 2″*	*27′ 4″*	*7′ 2″*	*12*	
Chance-Vought Aircraft																						
Div.	F4U-5	Fighter	1	5200	P&W R-2800-32W	2300	2800	1500	2600	30,000	234	470	26,800	.....	.....	12,901	9631	41′	34′	.....	*120*	Improved wartime Corsair
United Aircraft Corp.	XF7U-1	Fighter	1	.....	2 West. J-34	*3000*	*12,500*	.....	.....	.....	.....	.....	.....	.....	.....	*22,000*	.....	.....	.....	.....	....	Tailless; two after burners
Dallas, Texas	XF6U-1	Fighter	1	.....	West. J-34	*3000*	*12,500*	.....	.....	.....	.....	.....	.....	.....	.....	*9200*	.....	*30′ 2″*	*32′ 10″*	*11′ 9″*	30	Metalite structure; after burner
Chase Aircraft Co.	YC-122	Cargo	2	*8000*	2 P&W R-2000-11	1350	2700	1100	2550	8000	520	250	S.L.	25,000	1300	29,000	17,000	86′ 4″	56′ 7″	21′ 4″	....	1370 cu. ft. cargo
Parkway at Decou	YC-123	*Cargo*	...	*15,600*	*2 P&W R-2800*	*2100*	*2700*	.....	.....	.....	.....	*250*	.....	.....	.....	.....	.....	*110′*	.....	.....	....	
Trenton, N. J.																						
Consolidated Vultee	B-36B	Bomber	15	84,000	6 P&W R-4360-41	3500	2700	2650	2550	35,000	21,116	*320*	*30,000*	40,000+	*700*	*320,000*	136,000	230′	162′	46′ 4″	*154*	
Aircraft Corp.	XC-99	Cargo	10	.....	6 P&W R-4360-25	3000	2700	2500	2550	40,000	21,116	.....	.....	29,500	.....	265,000	132,000	230′	182′ 6″	57′	....	16,097 cu. ft. cargo; version
San Diego 12, Calif.	L-13	Liaison	3	.....	Fr. 0-425-9	245	3300	240	3200	S.L.	46	115	S.L.	15,000	720	2900	2022	40′ 5″	31′ 9″	8′ 5″	300	of B-36
	XP5Y-1	Search	...	.....	4 A. *T-40*	*5500*	.....	.....	.....	.....	*9000*	*390*	*25,000*	.....	*3000*	*138,000*	.....	*146′*	*130′*	*45′*	*1*	*High L/B ratio hull; turboprops*
Douglas Aircraft Co.	F3D-1	Fighter	2	.....	2 West. J-34-WE-24	*3000*	*12,500*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	50′	45′ 5″	16′ 1″	30	
3000 Ocean Park Blvd.	C-124A	Cargo	5	*50,000*	4 P&W R-4360-35	3500	2700	2650	2550	5500	11,000	.....	.....	.....	.....	175,000	94,557	173′ 3″	127′ 1″	48′ 3″	30	10,000 cu. ft. cargo; improved
Santa Monica, Calif.	AD-2, *3*	Attack	1	6000	Wr. R-3350-26WA	2700	2900	2300	2600	6200	*390*	*360*	*3500*	*25,000*	*1600*	16,649	10,632	50′	38′	12′	*356*	C-74
Fairchild E & A Corp.	C-82A	Cargo	5	.....	2 P&W R-2800-85	2100	2800	1700	2600	7300	2614	239	17,500	20,000	800	54,000	31,288	106′ 6″	77′	26′ 4″	....	2312 cu. ft. cargo
Hagerstown, Md.	C-119B	Cargo	5	.....	2 P&W R-4360-20	3250	2700	2650	2550	6000	2670	258	18,000	23,900	820	74,000	36,900	109′ 3″	85′ 10″	26′ 8″	144	8 Navy R4Q-1
	XNQ-1	Trainer	2	.....	Ly. R-680-13	295	2300	280	2200	S.L.	80	166	S.L.	19,500	1070	3750	2817	41′ 5″	27′ 11″	8′ 5″	....	USAF T-31; trainer competition
Grumman Aircraft Eng.	F8F	Fighter	1	*2000*	P&W R-2800-34W	2100	2800	.....	.....	.....	335	455	S.L.	42,300	6500	9300	*7000*	35′ 6″	28′ 3″	13′ 9″	....	
Corp.	F9F-2	Fighter	1	.....	P&W J-42-*P-6*	*5000*	*12,000*	.....	.....	.....	.....	*630*	*S.L.*	*40,000*	*6000*	*11,000*	*8800*	*41′ 2″*	*37′*	*13′*	*167*	
Bethpage, N. Y.	F9F-3	Fighter	1	.....	A. J-33-A-*8*	*4800*	*11,500*	.....	.....	.....	.....	*630*	*S.L.*	*40,000*	*6000*	*11,000*	*8800*	*41′ 2″*	*37′*	*13′*	*150*	
	SA-16A	Cargo	5	4100	2 Wr. R-1820-76	1425	*2700*	.....	.....	.....	.....	270	*20,000*	*25,000*	*1600*	*26,000*	*17,100*	80′	61′ 4″	24′ 5″	*38*	Amphibian; Navy JR2F-1

Engine symbols: *A—Allison* *C—Continental* *Fr—Franklin* *G.E.—General Electric* *Ja—Jacobs* *Ly—Lycoming* *P&W—Pratt & Whitney* *West—Westinghouse* *Wr—Wright*

Italics: Aviation Week estimates.

Manufacturer	Designation	Type	Crew	Cargo or bomb load, lb.	Powerplant: Number and make of engines	Max. hp. or lb. thrust	At rpm.	Normal rated hp.	At rpm.	At altitude, ft.	Fuel capacity, gal.	Performance: Max. speed, mph.	At altitude, ft.	Service ceiling, ft.	Rate-of-climb, ft. per min.	Weights: Gross weight, lb.	Empty weight, lb.	Dimensions: Span, ft., in.	Length, ft., in.	Height, ft., in.	Current orders	Remarks
Lockheed Aircraft Corp.	F-80C	*Fighter*	*1*	*2000*	*A. J-33-A-23*	*4600*	*11,500*				*800*	*605*	*S.L.*	*46,000*	*5100*	*15,300*	*8200*	*38' 11"*	*34' 6"*	*11' 4"*	*557*	
Burbank, Calif.	P2V-2, 3	*Search*	*7*	*8000*	*2 Wr. R-3350-24W*	*2500*	*2300*	*2100*	*2400*	*2500*	*2350*	*300*	.....	*23,200*	.....	*58,000*	*32,910*	*100'*	*77' 11"*	*28' 1"*	*82*	*World distance record 11,236 mi*
	C-121	*Cargo*	*5*	.....	*4 Wr. R-3350-75*	*2500*	*2800*	*2100*	*2400*	*2500*	.....	.....	.....	.....	.....	*105,000*	.....	*123'*	*95' 3"*	*23'*	*10*	*One VIP version*
	PO-1W	*ASW*	*11*	.....	*4 Wr. R-3350*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*105,000*	.....	*123'*	*97' 6"*	*23'*	*3*	
	XF-90	*Fighter*	*1*	.....	*West. J-34/2 rockets*	*3000*	*12,500*	.....	.....	.....	.....	*M. 1*	*35,000*	.....	.....	*18,000*	.....	*34' 6"*	*45'*	.....	*1*	*Penetration fighter*
	R60-1	*Cargo*	...	.....	*4 P&W R-4360-22W*	*3500*	*2700*	*2650*	*2550*	*5500*	.....	*303*	*25,000*	*28,600*	*1000*	*184,000*	*113,780*	*189' 1"*	*156' 1"*	*50' 4"*	....	
McDonnell Aircraft Corp.	XF-85	Fighter	...	.....	*West. J-34*	*3000*	*12,500*	.....	.....	.....	.....	*660*	*S.L.*	*48,000*	*12,000*	*5200*	*3600*	21'	15'	8'	....	Bomber parasite; tests successful
Lambert-St. Louis Field																						
St. Louis 21, Mo.	XF-88	*Fighter*	*1*	*2000*	*2 West. J-34*	*3000*	*12,500*	.....	.....	.....	.....	*700*	*S.L.*	*40,000*	*8000*	*16,000*	*9000*	*39'*	*54'*	*15'*	....	*Penetration fighter*
	FH-1	*Fighter*	*1*	.....	*2 West. J-30*	*1600*	*18,000*	*1300*	*16,000*	*S.L.*	*400*	*505*	*30,000*	*43,000*	*5200*	*12,000*	*7000*	*40' 9"*	*38' 9"*	*13' 2"*	....	
	F2H-1	*Fighter*	*1*	.....	*2 West. J-34*	*3000*	*12,500*	.....	.....	.....	.....	*630*	*30,000*	*48,000*	*9000*	*14,000*	*8400*	*41' 6"*	*38' 11"*	*14' 6"*	*179*	
Glenn L. Martin Co.	XP5M-1	Research	11	.....	2 Wr. R-3350	2700	2800	*2100*	*2400*	*2500*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	Exp. high L/B hull form
Middle River, Md.	P4M-1	Search	...	.....	2 P&W R-4360/ 2 A. J-33	*3000* / *4000*	*2700* / *11,500*	*2500*	*2550*	*13,000*	*4000*	*390*	*20,000*	.....	.....	*80,000*	*48,000*	114'	85' 3"	*26' 9"*	*24*	10,500 eq. hp.; landplane
	XB-48	Bomber	3	20,000	6 A. J-35	4000	*7600*	3270	.....	.....	.....	*520*	*35,000*	*43,000*	.....	102,600	58,500	108' 4"	85' 9"	27' 6"	....	
	JRM-2	Cargo	11	.....	4 P&W R-4360-4	3000	*2700*	2500	.....	.....	13,220	238	.....	17,670	652	165,000	80,311	200'	120' 3"	44' 7"	....	
	PBM-5A	Patrol	9	.....	2 P&W R-2800-34	2100	2800	1700	.....	.....	.....	.....	.....	.....	.....	60,300	39,698	118'	79' 10"	27' 6"	36	Amphibian
	AM-1	Attack	1	*6000*	P&W R-4360-4	*3000*	*2700*	.....	.....	.....	*800*	*374*	*20,000*	*27,500*	*2500*	29,000	*14,000*	50' 1"	41' 6"	16' 11"	*149*	Torpedo, bomb, rocket load
North American Aviation	XSN2J-1	Trainer	2	.....	Wr. R-1820-78	1100	*2500*	*1000*	*2300*	*6700*	376	308	21,750	32,200	2000	8406	.....	42'	33'	14'	....	
Municipal Airport	FJ-1	Fighter	1	.....	G.E.-A. J-35	4000	*7600*	.....	.....	.....	.....	*555*	*35,000*	*44,000*	*6000*	12,697	*8100*	38'	33'	14'	....	30 delivered
Los Angeles 45, Calif.	B-45	Bomber	4	.....	4 G.E.-A. J-35	4000	*7600*	.....	.....	.....	*4500*	*530*	*35,000*	40,000+	*2550*	82,600	.....	89'	74'	25'	139	
	F-86	Fighter	1	*2000*	G.E. J-47A	5000	*7700*	.....	.....	.....	.....	*670*	*S.L.*	40,000+	*5700*	13,715	*9200*	37'	37'	14'	554	World's speed record 670.98 mph.
	F-82	Fighter	2	*7200*	2 A. V-1710	2200	*5000*	*1100*	*2600*	*30,000*	*1210*	*436*	*30,000*	45,000	*6200*	20,750	*14,350*	51'	37'	16'	....	250 delivered; Twin Mustang
	T-28	Trainer	2	.....	Wr. R-1300	800	*2400*	*700*	*2400*	*5000*	.....	.....	.....	.....	.....	5862	.....	.....	.....	.....	268	Tricycle; won trainer competition
	AJ-1	Attack	3	*6000*	2 P&W R-4360/ G.E.-Allison J-35	*3000* / *4000*	*2700* / *7600*	.....	.....	.....	.....	*422*	*6000*	*30,000*	*2600*	*55,000*	.....	*65'*	*50'*	.....	28	Prototype destroyed
Northrop Aircraft Inc.	F-89	Fighter	2	.....	*2 A. J-35*	*4000*	*7600*	.....	.....	.....	.....	*560*	*S.L.*	*40,000*	.....	*32,500*	.....	*50'*	*50'*	*15'*	48	Scorpion all-weather fighter
Hawthorne, Calif.	C-125	Cargo	2	.....	3 Wr. R-1820-97	1200	*2500*	1000	*2300*	*6700*	1800	*210*	.....	17,400	1325	32,500	19,660	87'	67'	21'	23	Pioneer assault version
	XB-35	*Bomber*	*15*	*52,000*	*4 P&W R-4360*	*3000*	*2700*	*2500*	*2550*	*35,000*	*18,000*	*390*	*35,000*	*35,000*	*1550*	*209,000*	*89,000*	*172'*	*53'*	*30'*	....	*10 converting to RB-35A jet*
	YB-49	*Bomber*	*6*	*30,000*	*8 A. J-35-A-5*	*4000*	*7600*	.....	.....	.....	*19,000*	*532*	*S.L.*	*49,000*	*4400*	*213,500*	*88,100*	*172'*	*53'*	*30'*	....	
Republic Aviation Corp.	XR-12	Photo	7	.....	4 P&W R-4360-31	3000	*2700*	.....	.....	.....	*5570*	*470*	*40,000*	44,000+	*1600*	114,000	*65,000*	130'	94'	*28'*	....	2 del.; 1 destroyed
Farmingdale, N. Y.	F-84B	Fighter	1	*2000*	G.E.-A. *J-35-A-15*	3750	7700	.....	.....	.....	*900*	*600*	*S.L.*	*40,000*	*5000*	15,000	9000	37'	37'	*12' 10"*	*409*	
Ryan Aeronautical Co.	L-17B	Liaison	1	.....	C., E-185-3	205	2600	185	2300	S.L.	60.5	157	S.L.	15,600	830	2750	1838	33' 5"	27' 3"	.....	163	Navion; AGF, Nat. Guard
San Diego, Calif.																						
Texas Engineering & Mfg. Co.	TE-1A	Trainer	2	.....	C., *C-145*	145	*2700*	....	.....	*S.L.*	.....	160	.....	14,000	925	1880	.....	29' 4"	20' 11"	.....	....	Cmmrcl; trainer competition
Dallas, Texas																						

Engine symbols: *A—Allison* *C—Continental* *Fr—Franklin* *G.E.—General Electric* *Ja—Jacobs* *Ly—Lycoming* *P&W—Pratt & Whitney* *West—Westinghouse* *Wr—Wright*

Italics: Aviation Week estimates.

Steps Toward All-Weather Flight

Development of electronic airways system capable of handling high density traffic is goal of two groups.

Basic pattern for administration and technical development of a new electronic federal airways system, capable of handling high density traffic in any weather, was organized during 1948. In addition to agreement on the basic principles and equipment of this all-weather airways system for the United States it is highly probable that the International Civil Aviation Organization will approve them as an international standard.

Basic technical pattern for the all-weather airways is the Radio Technical Commission for Aeronautics report of its Special Committee No. 31. Two groups, formally organized during last year, will have the responsibility for modifying the requirements detailed in SC31. They are the Navigation committee of the Research and Development Board, and the Navigation Panel of the Air Coordinating Committee.

▶ **ANDB Role**—These two groups submit their operational requirements to the Air Navigation Development Board where research and development is directed to produce specific equipment items to meet operational requirements. RTCA continues to function as an advisory group on specific technical problems. During the past year it drew up specifications for distance measuring equipment that will make it possible for this item to move out of research and into production within the next year.

Approximately $65 million in federal funds will be authorized during fiscal 1950 to carry out the all-weather program. This contrasts with about $20 million authorized last year. The $65 million will be divided as follows: $40 million for Civil Aeronautics Administration equipment purchase; $10 million to ANDB for research; and another $15 for USAF and Navy equipment purchase.

▶ **Procurement Plan**—While ANDB will control expenditures of the research and development funds the bulk of its work will still be done by private companies and laboratories, under ANDB contracts.

Program is divided into two phases—the interim program, which is designed to utilize equipment already in the development stage; and the target program which is based on equipment not yet developed. During 1948, first steps were taken toward general use of elements in the interim system.

▶ **ILS First**—First component to go into general use was the VHF radio beam landing system (ILS) which is now operational at 57 U. S. civil airports. Next component, the omni-directional range, is expected to become operational by summer, with over 400 omni-range stations now installed and more than 50 calibrated and commissioned for actual use.

Deliveries of airborne receivers to utilize the omni-range have already begun and are expected to be of sufficient quantity to permit general airline use of the omni-range before the bad weather season begins again next fall. Big advantage of the omni-range over the present four course low frequency range is that it operates on static-free VHF frequencies and gives much more precise course and position information than the LF range. Further improvement in omni-range accuracy will be necessary for its use in the later phases of the interim program when automatic course computers will be used.

▶ **Traffic Control Radar**—Third element of the interim system now in sight is search radar, to be used for air traffic control in the approach zones to airports handling heavy traffic. Experimental installations of this type have been operating for over a year at Washington, New York and Pittsburgh with good results. General Electric was recently awarded a CAA contract to build 27 sets of traffic control for use at civil airports. Still needed for use with this type radar is an airborne radar beacon that will positively identify an individual aircraft on the ground radar scope.

Fourth element is distance measuring equipment which is nearing the end of its development stage and getting ready to go into production. Basic specifications for DME were drawn by RTCA and approved by both U. S. and British technical groups as an international standard.

▶ **Computer Progress**—The automatic course computer is still in the developmental stage. It is designed to permit straight line and circling courses that are not aimed at any omni-range station to be flown automatically. When computers reach a high enough degree of accuracy it may be possible to layout multiple lane airways on the omni-range system.

Other elements of the interim system still in early research stages are the ground taxi control device; private line visual communications system; and the coded airborne radar beacon for positive identification and automatic transmission of altitude and position.

▶ **Tests Needed**—One of the basic elements still missing from the all-weather airways development plan is an adequate program for service testing new equipment before it is adopted as a standard and installed for general use. ANDB has begun something along this line with its limited tests of the Indianapolis omni-range and DME but it is evident from the results of that series of tests that a more comprehensive test program along strictly technical lines is necessary to give the non-technical people concerned with the program a yardstick to measure equipment efficiency. This would enable them to cut through the combined fog of excessive manufacturers claims and "political" policies of the governmental agencies concerned to get a clear picture of what is going on in a program that will eventually mean expenditure of a billion dollars in federal funds and many more millions by the airlines and private pilots.

Guided Missiles In Production

After three years of research and experimental development, guided missiles are passing into the first phases of production. Major emphasis will continue to be on research and development for some time to come, with production limited primarily to training missiles to be used in teaching military personnel how to maintain and launch missiles of various types.

Present plans for the military services indicate that approximately $50 million will be spent on production of a few guided missile types during the next two years. Considerably more will be expended during the same period for continued missile research, and USAF is seeking authorization from Congress to establish a $200 million testing range to be used by all three services.

USAF now has nine basic guided missile production contracts with aircraft manufacturing firms. Basic policy of both USAF and Navy is to depend on the airframe manufacturing industry for guided missile production, since basic requirements for both piloted and pilotless planes are the same—light and strong construction of proper aerodynamic shapes. Increased missile production will mean more subcontracts to a group of new firms specializing in missile propulsion and control methods, as well as the established military contractors in electronic equipment and powerplants.

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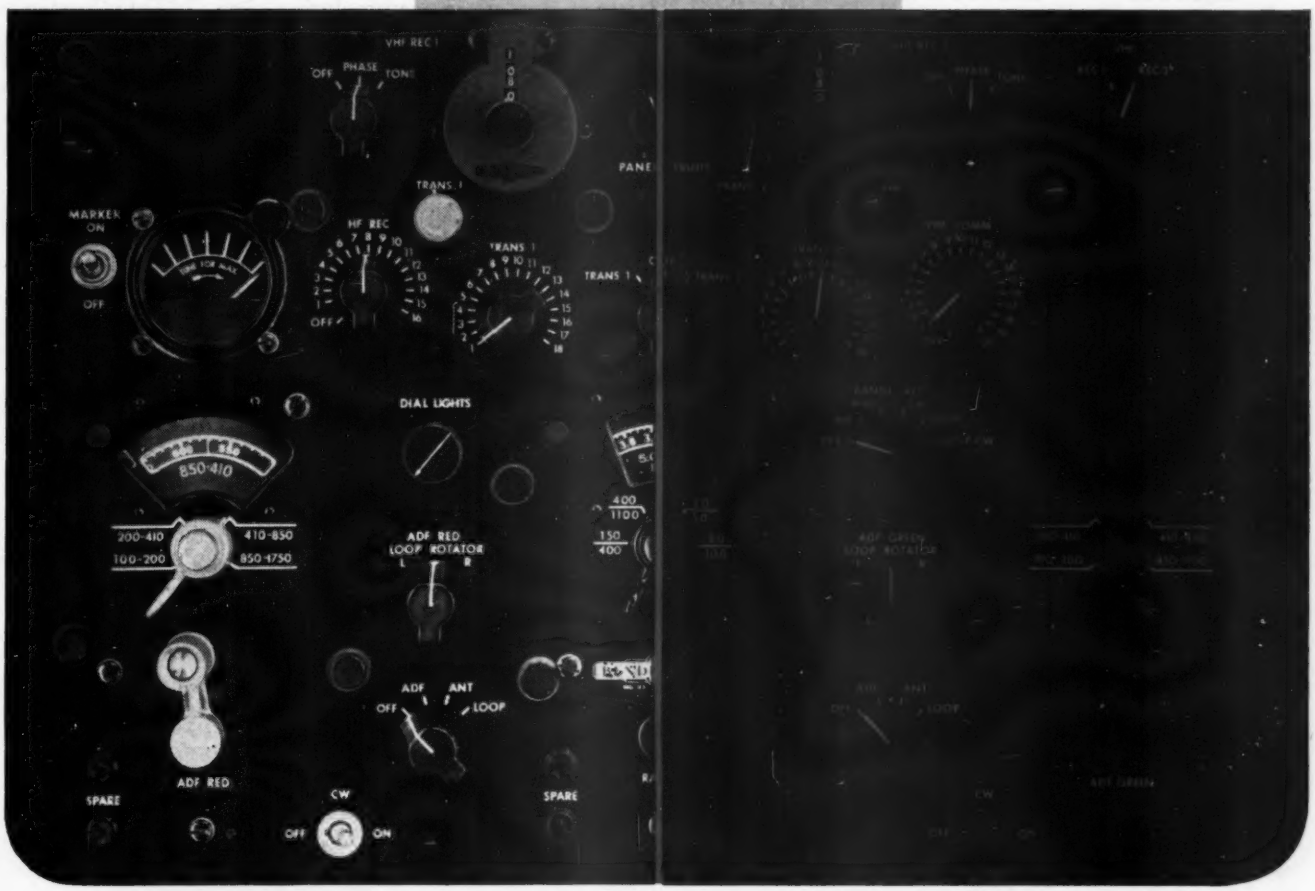

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SPEEDS READING . . . PREVENTS EYE-STRAIN

Everybody complains about panel lighting, but only Bendix Radio has done something about it. Here it is—one of the finest additions to cockpit comfort, pilot efficiency, and plane safety in years.

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Industry Regains Health and Productivity

Annual sales exceed billion dollars in 1948; to go higher this year.

The American aircraft industry hit the bottom of its postwar trough during 1948 and took a long step toward regaining a healthy technical and financial stature.

Financially the industry as a whole moved into the black for the first time since the end of the war. This compares with an operating loss of $115 million and a net loss of $32 million during 1947. Total sales of the 15 major manufacturers hit $1.1 billion during 1948, according to preliminary estimates. Sales in 1947 were $848 million. All but three of the major manufacturers—Bell, Convair and Martin—are expected to report modest profits for 1948. Indications now are that total sales will reach a new peacetime peak during 1949 with another small increase in prospect for 1950.

► **Near ACC Mark**—Technically, the industry approached the level set by the Air Coordinating Committee as the volume for a healthy aircraft production system. During 1948 the industry delivered slightly over 25 million airframe pounds of military planes—less than 5 million pounds short of ACC's standard. Military deliveries for 1949 are expected to exceed 35 million pounds with a total rising to 37 million pounds in 1950 when the full effect of current military plane orders will be felt by manufacturers.

The industry made 10,240 planes of all types during 1948, compared with 17,718 during 1947. Big decline was in personal planes where the trend from two-place trainers to four-place executive transports with higher sales prices continued.

► **Transport Decline**—Commercial transport production declined from 280 during 1947 to 240 in 1948. A backlog of about 140 transports remains for delivery during 1949, with a sharp drop in production anticipated for the final quarter unless the airline equipment financing picture changes radically.

Military plane production increased from 2100 and 12 million airframe pounds in 1947 to 2400 planes and 25 million airframe pounds in 1948. Approximately 3000 planes with airframe weight of 35 million pounds are scheduled for 1949 delivery with 1950 production anticipated at 4800 planes or double the 1948 rate.

► **Shot in Arm**—Expansion of military air power was the shot in the arm that lifted the industry out of its postwar crisis during 1948. Military air power budgets for fiscal 1949 and 1950 will result in orders for more than 6700

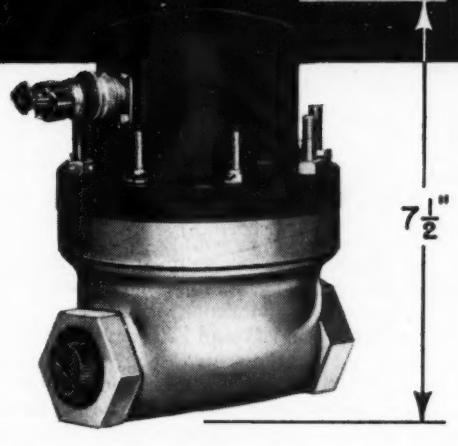
U. S. Aircraft Industry*

Company	Location	Plant Area (Sq. Ft.)	Plant Employment	1948 Sales[1]	Backlog[2]
Allison Div., GM....	Indianapolis 6, Ind.	4,000,000	8000	NA	NA
Beech Aircraft Corp.	Wichita 1, Kansas	974,763	2672	$24,141,120[3]	$16,000,000[3]
Bell Aircraft Corp.	Buffalo 5, N. Y.	950,000	2000	14,000,000	20,000,000
Boeing Airplane Co.	Seattle, Wash.	4,275,521	24,429	120,000,000	378,357,517
	Wichita, Kans.	2,406,855	7090		
Cessna Aircraft Co..	Wichita 15, Kans.	401,720	1184	14,295,221[3]	500,000[4]
	Hutchinson, Kans.	108,250	375		
Chase Aircraft Co., Inc.	Trenton, N. J.	480,000	1000	8,000,000	6,000,000
Consolidated Vultee Aircraft Corp.	San Diego, Calif.	3,471,000	8500	112,000,000	340,000,000
	Fort Worth, Tex.	2,302,000	13,800		
Curtiss-Wright Corp.	Columbus, Ohio	1,409,000	2517	73,838,698[5]	134,200,000
	Caldwell, N. J.	775,000	3885		
	Wood-Ridge, N. J.	2,277,000	7538		
Douglas Aircraft Co.	Santa Monica, Calif.		5000		
	El Segundo, Calif.	5,293,066	6000	80,251,121[6]	233,346,077
	Long Beach, Calif.		4000		
Fairchild E & A Corp.	Farmingdale, N. Y.	204,750	1236		
	Hagerstown, Md.	882,450	4226	38,000,000	85,000,000
	Winfield, Kan.	91,175	541[7]		
Aircraft Gas Turbine Div. General Electric Co.	West Lynn, Mass.	NA	NA	NA	NA
	Lockland, Ohio	700,000[8]	2000[8]		
Grumman Airc. Eng. Corp.	Bethpage, N. Y.	NA	4900	NA	160,000,000
Lockheed Aircraft Corp.	Burbank, Calif.	4,762,616	13,000	125,500,000	195,900,000
Glenn L. Martin....	Middle River, Md.	2,725,000	9800	70,000,000	94,000,000
McDonnell Aircraft Corp.	St. Louis, Mo.	1,570,000	7172	20,704,996[9]	90,000,000
North American Aviation, Inc.	Los Angeles, Calif.	3,937,052	13,376	94,782,739[3]	380,000,000
	Long Beach, Calif.		2540		
	Downey, Calif.		3237		
Northrop Aircraft, Inc.	Hawthorne, Calif.	1,183,000	5000	26,943,787[10]	90,000,000
Piasecki Helicopter Corp.	Morton, Pa.	88,000	800	2,977,986	NA
Republic Aviation, Inc.	Farmingdale, N. Y.	1,500,000	6000	50,000,000	58,000,000
Ryan Aeronautical Corp.	San Diego, Calif.	640,000	2600	8,000,000	10,000,000
United Aircraft Corp.	East Hartford, Conn. (Pratt & Whitney)	3,000,000	51,140	157,250,707[5]	335,000,000
	East Hartford, Conn. (Hamilton Standard Div.)	500,000	2230		
	Dallas, Texas (Chance Vought Div.)	1,800,000	6500		
	Bridgeport, Conn. (Sikorsky Div.)	250,000	1170		
TOTALS.....		52,958,218[3]	235,458[3]	$1,039,785,375	$2,626,303,594

** Prime engine and airframe contractors for the services.*
[1] Unofficial estimates for calendar year 1948 except where shown.
[2] Estimated. Does not include Government Furnished Equipment.
[3] Fiscal year ending September 30, 1948.
[4] Military aircraft only.
[5] 9 mo. to September 30, 1948.
[6] 9 mo. to August 31, 1948.
[7] Winfield and all others.
[8] Estimated.
[9] Fiscal year ending June 30' 1948.
[10] Fiscal year ending July 31, 1948.
Source: Manufacturers' reports and AVIATION WEEK estimates.

Revere INSTRUMENTS...

Standard Equipment on Jet Aircraft



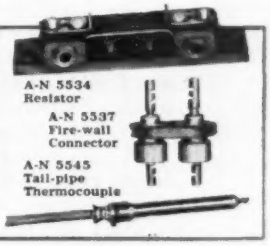
THE ONLY JET FIGHTER PLANES equipped for Arctic operation are the Lockheed F-80C Shooting Stars of the famous U. S. Air Force "Hat-in-the-Ring" Squadron. First mass tactical operation of jet aircraft in the Arctic was made possible by special "winterizing" of the F-80Cs at Lockheed's Burbank plant. New tactics for polar warfare and ground crew training for 65 below-zero temperatures were developed on this unusual Air Force training mission.

The Allison J-33 engines were modified for starting with gasoline after all-night parking. Shortly after starting, engines are switched over to kerosene, regular jet plane fuel.

• The R-862-D4 Totalizing Fuel Flow Transmitter is used as standard equipment on several of the U.S. Air Forces latest type Jet Planes. Revere also manufactures Instantaneous Rate Fuel Flow Meters for Aircraft and Industrial Application.

Revere is currently engaged in an extensive experimental and development program on meters for various type fuels with capacities up to 100 G.P.M.

Revere manufactures all types of Thermocouple Equipment for both production and test Jet Aircraft... A-N Spec. Tail-Pipe Thermocouples, Harnesses, Thermocouple Wire, Fire-wall Connectors, Leads and Lead Wire, Pitot Tubes and Survey Rakes.



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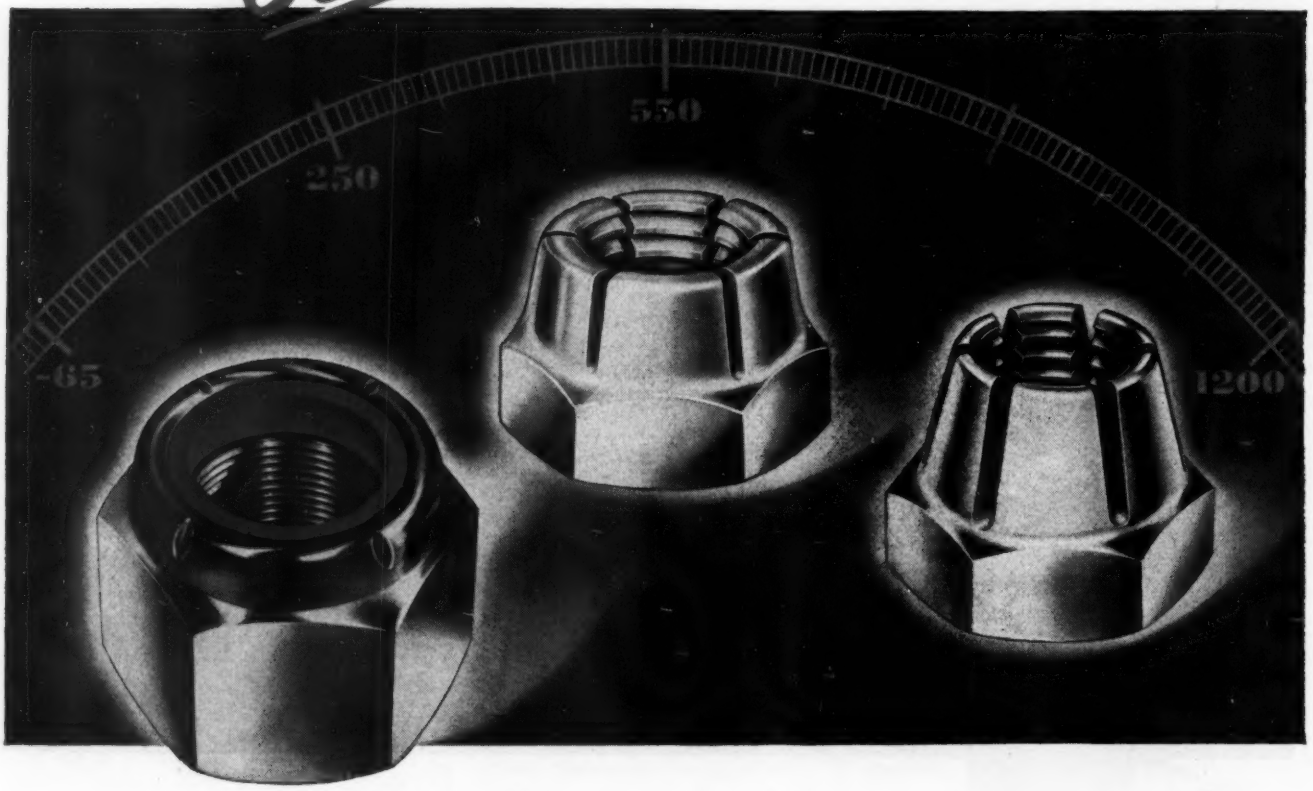

—*famous Elastic Stop Nuts protect permanently against* VIBRATION! IMPACT!

With the addition of the new Z-550 and Z-1200 series, ESNA now has a specific nut design for all temperatures ranging from minus 65° F. to plus 1200° F. Self-locking, in both fully seated and positioned settings, these fasteners provide permanent protection against *vibration, impact* and *stress reversal.*

The two new nut designs represent the most efficient solution found by ESNA engineers after detailed research and production line studies of fastening problems encountered under elevated temperatures. Both fully meet ESNA standards for controlled quality and full interchangeability on class 3 bolts with minimum torque scatter. This controlled torque which is a feature of all ESNA nuts assures uniform bolt loading and permits more compact design, with resulting weight reduction. It also simplifies maintenance problems and speeds up field replacements.

Specifically, for applications between −65° F. and +250° F., the nut with the famous red fiber collar offers unequalled protection against vibration, thread corrosion and liquid seepage. The ZM and ZE nuts are designed for sustained temperatures up to 550° and the Z-1200 series has been engineered to withstand multiple cycles of exposure to extreme temperatures up to 1200° F. without seizure. Like all Elastic Stop Nuts, these fasteners are readily removed—do not damage threads or gall the finish—and they can be reused.

HERE'S A CHALLENGE: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts—FREE, in experimental quantities. Or, if you want further information, write for literature. Elastic Stop Nut Corporation of America, Union, N. J. Representatives and Agents are located in many principal cities.

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ELASTIC STOP NUTS

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ANCHOR

WING

SPLINE

CLINCH

GANG CHANNEL

NYLON CAP

OVER 450 TYPES AND SIZES IMMEDIATELY AVAILABLE FROM STOCK

planes and military sales of better than $5 billion during the next three years, according to the Bureau of the Budget.

The aircraft industry was facing a grim prospect in the spring of 1948. Lack of sufficient military orders meant that many production lines would face a shutdown by early summer. More than a few companies faced exhaustion of their working capital, loss of skilled labor forces and the dissipation of their design engineering teams. Production experts estimated that even if sizable military orders were forthcoming in the fiscal 1949 budget they would come too late to avert this crisis and it would take the industry more than a year to recover from the effects.

► **Crisis Averted**—To avert this, aircraft procurement funds of the fiscal 1949 budget were rushed through Congress as a fiscal 1948 supplemental appropriation bill so that they would be available for expenditure in the spring of 1948 instead of early fall as was normal procedure.

Congress added some $822 million to the President's aircraft procurement budget that gave the industry contract authorization to build 3624 planes. U. S. Air Force rushed letters of intent to successful contractors by early summer. With these letters of intent firms could get new financing and were able to keep their production lines going. These orders also stimulated the first expansion of the industry from its postwar low.

► **New Plants**—During 1948 several wartime facilities were returned to active production. These include the Boeing Wichita plant now modifying B-29s and B-50s and tooling up for B-47 production; the General Electric plant at Lockland, Ohio, now rolling out J-47 jet engines; the old Pratt & Whitney plant at Omaha now being tooled for Westinghouse jet engine production, and another General Electric facility devoted to electronic armament systems.

Both USAF and Navy organized their standby plant program to provide government-owned production facilities for swift initial expansion of the aircraft industry to meet an emergency.

► **Employment Rise**—Employment rose steadily from 160,000 to 227,000 workers and is still climbing. Shortages of skilled personnel continue in some categories, particularly among engineers and tool fabricators.

With the exception of a few well-established production lines such as the Lockheed F-80 series, the Republic F-84 and Boeing's B-50 line, all of which enjoyed extended operations as result of the expanded military airpower program, the industry is still in the production tooling phase of the overall program. None of the new types such as the B-54, B-47 and F-89 or-

U.S. Gas Turbine Engines

Manufacturer	Model	Type	Compressor stages	Turbine stages	Pressure ratio	Static thrust, lb.	At rpm. at sea level	Rated thrust, lb.	At rpm.	At altitude (ft.)	Maximum overspeed, rpm.	Shaft hp.	At rpm. at sea level	Fuel flow, gph.	Spec. fuel cons. lb./hr./lb. thrust	Turbine inlet, F. Deg.	Tailpipe, F. Deg.	Overall length, in.	Overall diameter, in.	Dry weight, lb.	Accessories, lb.	Gross weight, lb.
Allison Division, General Motors Corp. Speedway Indianapolis 8, Ill.	400-C5-AF (J33-A-23)	C	1	1	4.4:1	4600	11,750	3900	11,250	SL	11,750	....	.....	750	1.13	1550	1265	103	50.5	1775	99	....
	460 AF (J35-A-13)	AF	11	1	4.0:1	3750	7700	3270	7400	SL	7700	....	.....	597	1.08	1515	1250	145	37.5	2455	..	....
General Electric Co., Aircraft Gas Turbine Div. West Lynn, Mass.	TG-100B (T-31)	TP	14	1	5.5:1	500	13,000	....	.....	..	.....	1600	13,000	...	0.768[5]	1900	1265	115	35	....	..	1984
	TG-190 (J-47)	AF	..	.	.....	5000[4]	.....	....	.....	..	.....	....	.....	...	.....	....	....	144[2]	37[2]	....	..	2400[2]
Frederic Flader Inc. N. Tonawanda, N. Y.	134 (J-55-FF-1)	AF	..	1	.....	700	26,800	770[3]	28,200	SL	.....	....	.....	...	1.64	....	1170	79	15.75	....	..	300
Pratt & Whitney Aircraft Div. United Aircraft Corp. East Hartford 8, Conn.	JT-6B Turbo-Wasp (J-44-P4)	C	1	1	.....	5000	.....	4000	.....	..	.....	....	.....	...	1.09	....	1365	98.3	49.5	1715[4]	..	....
Turbodyne Corp. Northrop Aircraft, Inc. Hawthorne, Calif.	Turbodyne 2 (XT-37)	TP	..	Designed for 10,000 shaft hp.																		
Westinghouse Electric Corp. Aviation Gas Turbine Div. Philadelphia, Pa.	XJ30WE-4 (X9.5A)	AF	6	1	.....	1365	18,000	525	18,000	30,000	.....	....	.....	...	1.280	....	....	89.8	19	809	..	....
	XJ32WE-2 (X9.5B)	AF	6	1	.....	260	34,000	184	34,000	10,000	.....	....	.....	...	1.600	....	....	49.9	9.5	145	..	....
	XJ32WE-4 (X9.5B)	AF	6	1	.....	275	36,000	217	36,000	10,000	.....	....	.....	...	1.550	....	....	55.2	9.5	143	..	....
	J-30WE-20 (19XB-2B)	AF	10	1	.....	1560	17,000	...	.....	.....	.....	....	.....	...	1.170	....	....	94	19	693	..	....
	J-34WE-22 (24C4B)	AF	11	2	.....	....	.....	...	.....	.....	.....	....	.....	...	.....	....	....	120	27	1166	..	....
	J-34WE-30 (24C4C)	AF	11	2	.....	....	.....	...	.....	.....	.....	....	.....	...	.....	....	....	120	27	1200	..	....

AF--axial flow; C--centrifugal; SL--sea level; TP--turboprop. • per hp.; 1--takeoff thrust (10,000 hp. at 750 mph.); 2--approximate; 3--at takeoff; 4--includes standard accessories.

U. S. Propeller Manufacturers

Manufacturer	Classifications	Pitch Actuation	Hp. Range	Price Range	Blade Data			Military Planes Using
					No.	Diameter	Constr.	
Aeromatic Aircraft Propellers Koppers Co., Inc. Metal Products Div. Baltimore, Md.	GA, AV	Mech	50–500	$400	2 to 4	68" to 120"	Wo[1]	.....
Aeroproducts Division General Motors Corp. Dayton, Ohio	CP, CS, RP, CR, FF, AV	Hyd	50–3000+	.....	2 to 8	8' to 16'	St	C-45, F-82, F8F, AD-1, AD-2, AD-3, F-51H, P4M
Curtiss-Wright Corp. Propeller Div. Caldwell, N. J.	CS, RP, FF, CR	Elec	1000–3000+	$5000–$25,000+	3 to 8	13' to 21'	St	AM-1, PBM-5, B-50, B-36, YC-97, C-99, F-12, C-121, C-118, B-29, B-54
Fahlin Manufacturing Co. Columbia, Mo.	FP	.....	50–200	$50–$100	2	40" to 100"	Wo	
Flottorp Mfg. Co. Grand Rapids, Mich.	FP, GA, CP	Mech, Elec	50–500	$50–$1000	2	66" to 102"	AL, Wo	L-13
G. B. Lewis Co. Watertown, Wis.	FP	.....	50–200	$50–$100	2	68" to 86"	Wo	.....
Hamilton Standard Propeller Div. United Aircraft Corp. E. Hartford, Conn.	CP, CS, RP, FF, TP	Hyd	200–3000+	.....	2 to 4	8' to 16' 6"	AL, St	C-97, C-119, C-125, C-123, SA-16, C-69, B-29, B-26, AM-1, AJ, F4U-5, JR2F, PF, P2V, XNQ-1, JRB, P5M
Hartzell Industries, Inc. Hartzell Propeller Co. Div. P. O. Box 909 Piqua, Ohio	FP, GA, TP, CP	Hyd	50–500	$50–$400	2	72" to 84"	Wo, AL	.....
McCauley Corp. Dayton 7, Ohio	FP	.....	50–165	$125–$225	2	70" to 76"	AL	L-16A, L-16B, L-15
Sensenich Corp. Lancaster, Pa.	FP, GA, TP, CP, CS	Hyd	50–2000[2]	$50–$400	2 to 4	18" to 110"	Wo, AL	PT-Trainers, PQ-Radio Controlled Target Planes, Air Force Liaison Planes
U. S. Propellers, Inc. 3270 E. Foothill Blvd. Pasadena 8, Calif.	FP	.....	50–200	$50–$100	2	32" to 169"	Wo	OQ19, KDR, KD2R

[1] *Laminated birch veneer bonded with synthetic resin—finished blade covered with cellulose nitrate sheet.*
[2] *Propellers for 200 hp. to 2000 hp. are test clubs.*

AL—aluminum alloy
AV—automatically variable
CP—controllable pitch
CR—counter-rotating
CS—constant speed
Elec—electric
FF—full feathering
FP—fixed pitch
GA—ground adjustable
Hyd—hydraulic
Mech—mechanical
RP—reverse pitch
St—steel
TP—two position
Wo—laminated wood

dered under fiscal 1949 procurement are yet in production.

► **1950 Peak**—Types originally ordered with fiscal 1948 contract authorization, such as North American's F-86 and B-45 are just beginning to roll off assembly lines at a significant rate. The program as a whole will not move into the high volume production phase until 1950.

Another significant re-appearance in the industry is that of subcontracting on an expanding scale. USAF particularly has indicated that it favors subcontracting as a method of keeping firms going who do not receive prime airframe or engine contracts. Boeing, with the largest share of the current military airframe contracts, is subcontracting nearly 50 percent of its work, much of it in airframe subassemblies, to other manufacturers low on prime contracts.

► **Industry Problems**—Among the problems still facing the industry are:

• **Five-year procurement program**—Legislation authorizing a five-year contract authorization program for military aircraft procurement is still bogged down on Capitol Hill although there is no outstanding opposition to it. Passage of this bill would help level off the irregular pattern of high peaks and deep valleys of aircraft production and allow companies to plan production more efficiently.

• **Renegotiation**—Details of how renegotiation of aircraft procurement contracts will be handled has not yet been determined by the National Military Establishment. Until this is set profit margins are uncertain.

• **Technical progress**—Extremely rapid technical progress exemplified by jet propulsion and supersonic flight have forced military services to revise their aircraft procurement plans more often than usual, resulting in an unusually rapid reshuffling of military business within the industry. Engineering design teams are the key to this stiff technical competition. Production techniques are rapidly changing as high speed jet-powered planes account for a higher volume of the industry's work.

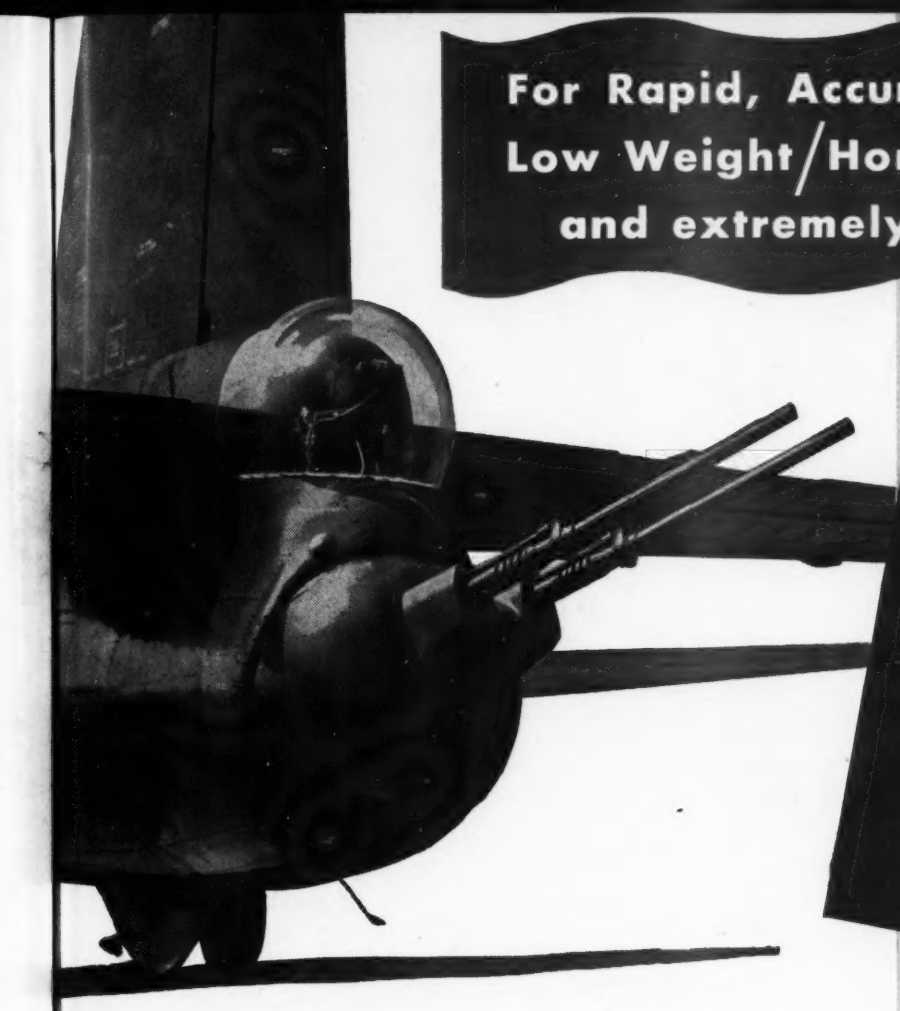
• **Mergers**—Military officials have indicated they believe the aircraft manufacturing industry now has too many firms to be adequately supported by peacetime programs and has urged mergers among existing companies as a means of reducing management overhead while retaining production facilities for emergency use.

Women and Jobs

Proportion of women in aircraft jobs continued at 13 percent during 1948, and there are no indications that this will be increased soon, if at all.

Total number of women employed rose during the year, but only in direct proportion to the increase in total employment, according to the U. S. Employment Service.

At the peak of the war, there were nearly 800,000 women in aircraft plants, between 35 and 40 percent of the total. Today they barely fill 30,000 jobs, many of them clerical.



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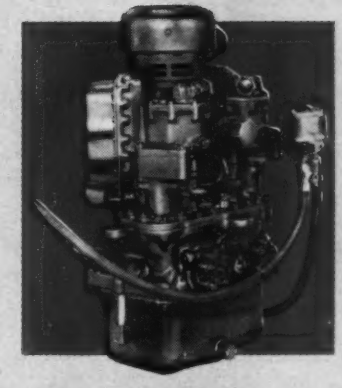
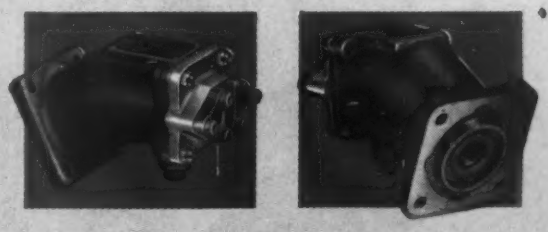


Vickers Double Pump and Control assembly provides complete and independent control of speed and rotation of two hydraulic motors.



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Scheduling Problem In Materials Flow

Expediters in the aircraft industry will have to stay on their toes this year to keep important materials flowing into production lines.

What Congress adds to the President's budget, for procurement of aircraft is the big unknown factor in determining just what materials will be critically short.

The Munitions Board figures that up to a billion dollars over the Presidential budget figure can be absorbed without causing any trouble. If the ante is raised any more than that, the demand by the aircraft industry and its suppliers might cause some real strain.

On the present basis, the military does not expect any critical shortages of materials, but there will be times when fast thinking and even faster footwork will be in order to keep the flow of materials going. It will be a problem of scheduling, rather than actual shortages, according to the Munitions Board. The Air Materiel Command at Wright Field has a materials scheduling committee working which will be instrumental in helping manufacturers lick their spot shortage problems.

► **Aluminum**—Contrary to a popular misconception, aluminum sheet will not be a shortage problem. Extrusions, however, will be short, not critically, but enough to demand close attention by stockmen and expediters. Main problem here will be to see that one company does not accumulate a large reserve of a tight commodity, while another is down to the last bin-full.

Magnesium, although in increasing use in military planes, is not expected to be short enough to curtail any production.

► **Steel**—High-temperature steel alloys will be fairly hard to get, mainly because the steel industry will be loath to turn out the small quantities needed in airplane production. Expediters again will have to do a lot of scrounging around warehouses. Another reason there may be shortages here is that several of the alloying materials, mainly cobalt and columbium, are critically short and the steel people are finding them hard to come by.

There are no problems anticipated regarding copper, zinc, antimony, cadmium, or other non-ferrous materials. There is one exception—lead. This heavy metal is in short supply the world over, and there may be some spot shortages of it in such items as sheathed cable, shields, or ballasted items. Here again, however, it will be up to the expediter to work out schedules of deliveries with the industry and Wright Field.

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Aircraft Jobs and Wages Continue Up

The number of aircraft jobs rose steadily during 1948 and the upward trend will continue this year. Wages and hours worked also climbed, but the wage rise may be slowed, though not stopped completely, this year.

Bureau of Labor Statistics figures indicate that the steady month-by-month rise in employment of production workers in aircraft plants last year was broken only by a sharp drop in May from 162,100 to 150,200. Actually, this was only a reflection of the strike of nearly 15,000 Boeing workers at the end of April. The jobs were there, but not the men.

▶ **Climb**—From January to December, employment of production workers in aircraft—airframe, parts and engines—climbed from 160,000 to an estimated 179,000. The 13,000 loss of 1947 was recouped with 6000 more jobs added.

Of 54 aircraft plants reporting to the U. S. Employment Service, 37 showed job increases totaling 13,100. In only three areas, was the gain more than 1000. Biggest gains were in Seattle, Dallas and Fort Worth.

The Dallas rise reflects the transfer of Chance Vought Aircraft from Bridgeport, Conn. This shift is also responsible for the only significant decline of employment—in Bridgeport.

▶ **Rise Seen**—The outlook for a continuing rise in aircraft jobs is based on reports by large aircraft employers to USES. They say they will need 18,000 more employees by next June. This would bring total employment, includ-

Monthly Employment

1948

	Aircraft & Parts (excl. engines)	Aircraft Engines
Jan.	134,700	25,300
Feb.	135,300	24,900
Mar.	136,100	24,600
Apr.	137,300	24,800
May	125,100	25,100
June	127,600	25,900
July	130,300	25,600
Aug.	133,500	21,600
Sept.	138,500	26,700
Oct.[1]	145,300	27,500
Nov.[1]	149,800	28,000
Dec.[2]	150,400	28,600

[1]Preliminary
[2]Estimated

NOTE: Above figures from Bureau of Labor Statistics are lower than employment figures from the United States Employment service because BLS figures cover only production workers.

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- "Monel"† and "Inconel" Nickel Alloys

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U. S. Reciprocating Engines

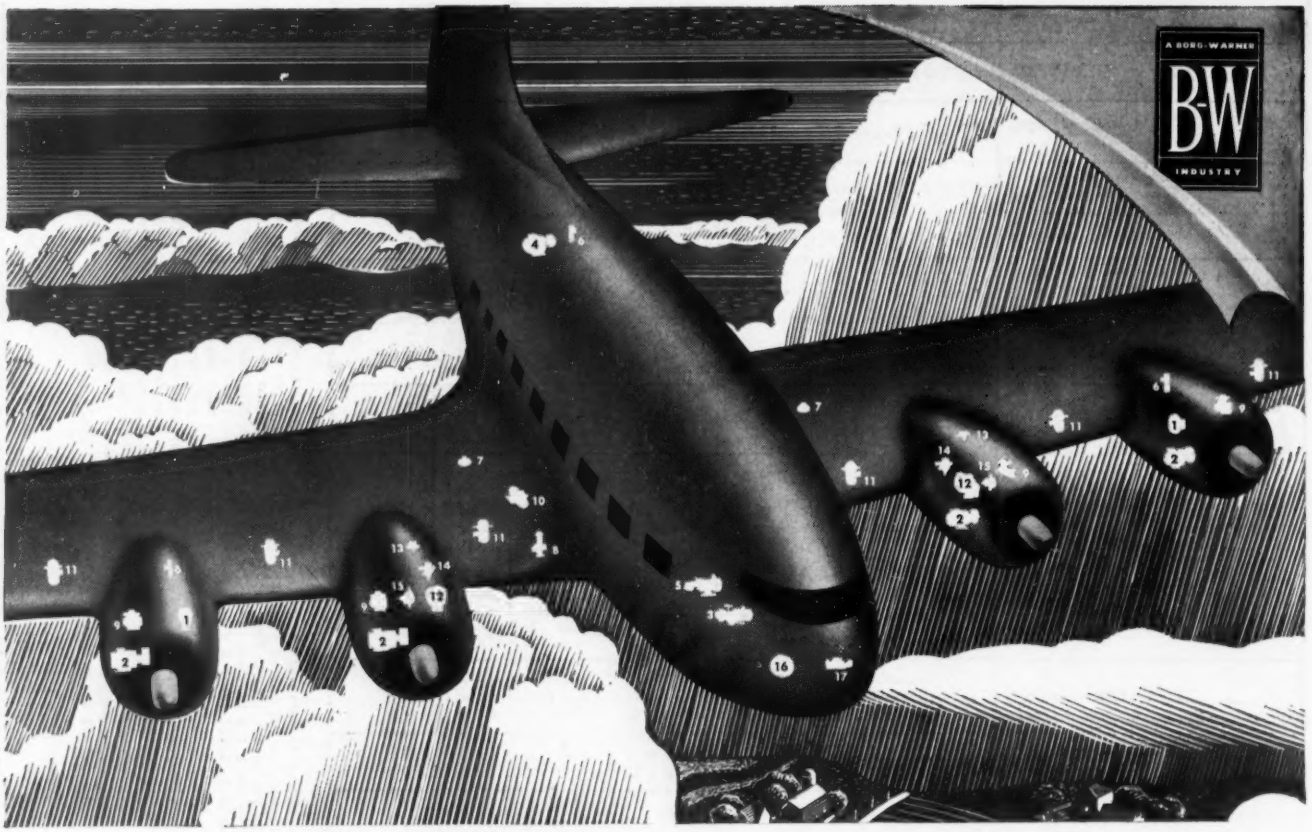
Manufacturer	Model	Cooling System	Number of Cylinders	Cylinder Arrangement	Propeller Drive	Rating				Weights		Bore and stroke (in.)	Displacement (cu. in.)	Compression Ratio	B.M.E.P.	Blower Ratio	Dimensions			Guaranteed Fuel Consumption at Cruising Hp. (lb. per hp. per hr.)	Cylinder Construction	Make spark plugs supplied with engine	Make Ignition	Make of Carburetors	Make of Starter
						Rated Hp.	At R.P.M.	At Altitude (ft.)	Octane Fuel	Total dry without hub or starter	lb. per hp.						Diam. Mount Ring or distance between bearers (in.)	Ht. or O.D. (in.)	Length without starter (in.)						
Aircooled Motors, Inc. Syracuse 8, N. Y.	4A4-90-B3	A	4	ho	D	90	2300	SL	80	230*	2.56	4.5x3.5	225	7:1	138	.....	31.21	27.59	30.68*	.50	ai	Ch	Ei	MS	Au
	4A4-100-B3	A	4	ho	D	100	2550	SL	80	230*	2.30	4,5x3.5	225	7:1	138	.....	31.21	27.59	30.68	.50	ai	Ch	Ei	MS	Au
	6A4-150-B3	A	6	ho	D	150	2600	SL	80	321*	2.14	4.5x3.5	335	7:1	136	.....	31.21	22.59	37.37*	.50	ai	Ch	Ei	MS	BR
	6A4-165-B3	A	6	ho	D	165	2800	SL	80	324*	1.97	4.5x3.5	335	7:1	140	.....	31.21	25.21	37.37*	.50	ai	Ch	Sc	MS	DR
	6V4-178-B32	A	6	vo	D	178	3000	SL	80	308*	1.73	4.5x3.5	335	7:1	140	.....	30.81	38.18	30.75	.52	ai	Ch	Sc	Be,MS	DR
	6V4-165-B32F	A	6	vo	D	165	3000	SL	80	356*	2.16	4.5x3.5	335	7:1	138	.....	30.81	42.50	30	.55	ai	Ch	Sc	Be,MS	DR
	6V4-200-C32	A	6	vo	D	200	3100	SL	91	333*	1.66	4.5x3.5	335	8.5:1	152	.....	31.12	38.18	29.03	.52	ai	Au	Sc	Be,MS	DR
	6AG4-165-B12	A	6	ho	G-1	185	3100	SL	80	369*	1.80	4.5x3.5	335	7.5:1	145	.....	31.15	26.12	40.59*	.51	ai	Ch	Sc	Be,MS	DR
	6V6-245-B16F	A	6	vo	D	245	3275	SL	80	353*	1.44	4.7x4	425	7.5:1	140	.....	33.28	38	39.21	.52	ai	AC	Ei	Be	..
	6A8-215-B8F	A	6	ho	D	215	2500	SL	80	487*	2.26	5x4.2	500	7:1	136	.....	33.90	29.25	66	.55	ai	Au	Ei,Sc	MS	Au
Continental Motors Corp. Market Street Muskegon 82, Mich.	A65-8F	A	4	ho	D	65	2300	SL	73	170	2.6	3.8x3.6	171	6.3:1	...	.....	.....	25.3	28.9	.49	als	Ch	Ei	Be	..
	C85-8F	A	4	ho	D	85	2575	SL	73	176	2.07	4x3.6	188	6.3:1	139	.....	.....	25.3	28.9	.51	als	Au	Be	Be	..
	C85-8FJ	A	4	ho	D	85	2575	SL	73	180	2.11	4x3.6	188	6.3:1	139	.....	.....	25.3	28.9	.51	als	Au	Be	Ex	DR
	C85-12F	A	4	ho	D	85	2575	SL	73	185	2.17	4x3.6	188	6.3:1	139	.....	.....	24.4	31.25	.51	als	Au	Be	Be	DR
	C85-12FJ	A	4	ho	D	85	2575	SL	73	189	2.22	4x3.6	188	6.3:1	139	.....	.....	24.4	31.25	.51	als	Au	Be	Ex	DR
	C90-12F	A	4	ho	D	90	2475	SL	80	186	2.06	4x3.8	201	7:1	143	.....	.....	24.4	31.25	.52	als	Au	Be	Be	DR
	C125-2	A	6	ho	D	125	2550	SL	73	257	2.05	4x3.6	282	6.3:1	...	.....	.....	27.4	39.4	.50	als	Ch	Be	MS	DR
	C145-2	A	6	ho	D	145	2700	SL	80	257	1.77	4x3.8	301	7:1	145	.....	.....	27.4	39.4	.50	als	Ch	Be	MS	DR
	E165-2	A	6	ho	D	165	2050	SL	80	325	1.97	5x4	471	7:1	...	.....	.....	22.3	35.5	.51	als	BG	Be	Be	DR
	E185-1	A	6	ho	D	185	2300	SL	80	318	1.72	5x4	471	7:1	...	.....	.....	22.3	47.3	.50	als	BG	Be	Be	DR
	E185-3	A	6	ho	D	185	2300	SL	80	326	1.75	5x4	471	7:1	...	.....	.....	22.3	47.3	.50	als	BG	Be	Be	DR
	W670-23	A	7	Rad	D	240	2200	SL	80	519	2.16	5.1x4.6	667.8	6.1:1	130	.....	20	42.5	35.6	.52	als	Ch	Be	Be	..
	R-9A	A	9	Rad	D	500	2300	SL	91-96	705	1.34	5x5.5	971.9	6.3:1	...	10.15:1	.....	45.2	42.5	.46	als	Ch	Be	Be	..
Hermann Engineering Co. 1405 Airway Glendale 1, Calif.	373-CW12	W	12	cps	D	190	1800	SL	80	246	....	3.25x3.75	373	7.5:1	...	.....	.....	.....	41.5	...	...	Au	Au,Sc	MS,Be	DR
Jacobs Aircraft Engine Co. Pottstown, Pa.	0-240A	A	4	ho	D	100	2300	SL	80	200	2.0	4.37x4	241	6.5:1	143	.....	16	18.1	39.6	.50	als	op	DR,Ei	MS	DR
	0-360A	A	6	ho	D	165	2400	SL	80	300	1.82	4.37x4	361	6.5:1	151	.....	16	18.1	47.4	.50	als	op	DR,Ei	MS	DR
	R-755A	A	7	Rad	D	300	2200	SL	80	505	1.68	5.25x5	757	6:1	143	.....	16.5	44	39.5	.45	als	Ch	Sc	Be	Ex
	R-755E	A	7	Rad	G-2	350	2500	SL	91	600	1.72	5.25x5	757	6.5:1	146	.....	16.5	44	42.3	.46	als	Ch	Sc	Be	Ex
	R-915A	A	7	Rad	D	375	2300	SL	80	560	1.49	5.5x5.5	914	6:1	141	.....	16.5	45.6	40.4	.50	als	Ch	Sc	Be	Ex
Lycoming Div., AVCO Mfg. Co. Williamsport 38, Pa.	O-145-B2	A	4	ho	D	65	2550	SL	73	165	2.54	3.6x3.5	144.5	6.5:1	140	.....	....	20.59	24.62	.51	ai	Ch	Sc	MS	..
	O-235-C	A	4	ho	D	100	2600	SL	73	243*	2.43	4.3x3.8	233.3	6.5:1	136	.....	....	22.5	29.5*	.60	als	Ch	Sc	MS	DR
	O-235-C1	A	4	ho	D	108	2600	SL	80	236*	2.18	4.3x3.8	233.3	6.75:1	141	.....	....	22.5	29.5*	.52	als	Ch	Sc	MS	DR
	O-290-A	A	4	ho	D	125	2600	SL	80	273*	2.18	4.8x3.8	289	6.5:1	132	.....	....	26.64	31.40*	.56	als	Ch	Sc	MS	DR
	GO-290-A	A	4	ho	G-3	160	3000	SL	91-98	376*	2.35	4.8x3.8	289	7.5:1	146	.....	....	28.5	34.59*	.60	als	Ch	Sc	MS	DR
	O-435-A	A	6	ho	D	190	2550	SL	80	392*	2.32	4.8x3.8	434	6.5:1	136	.....	....	29.59	38.1*	.58	als	Ch	Sc	MS	DR
	GO-435-A	A	6	ho	G-3	240	3000	SL	91-98	435*	1.83	4.8x3.8	434	7.5:1	146	.....	....	29.59	40.7*	.60	als	Ch	Sc	MS	DR
	GSO-580	A	8	ho	...	320	3000	SL	91-98	619	1.67	4.8x3.8	578	7.5:1	146	7.91:1	....	19.97	57.98	.50	als	Au	Sc	Be	..
	XR-7755	W	36	Rad	...	5000	2600	...	.....	6050	....	6.3x6.7	7755	.....	...	.....	....	.....	.....	...	...	..	....	....	..
McCulloch Motors Corp. 6101 West Century Blvd. Los Angeles, Calif.	4300C	A	4	ho	D	65	4100	SL	73-100	77.5	1.18	3x3.12	88	7.80:1	70.2	.....	9.15	15	26.75	.90	ai	Ch	Own	Own	..

Manufacturer	Model	Cooling System	Number of Cylinders	Cylinder Arrangement	Propeller Drive	Rating				Weights		Bore and stroke (in.)	Displacement (cu. in.)	Compression Ratio	B.M.E.P.	Blower Ratio	Dimensions			Guaranteed Fuel Consumption at Cruising Hp. (Lb. per hp. per hr.)	Cylinder Construction	Make spark plugs supplied with engine	Make Ignition	Make of Carburetors	Make of Starter
						Rated Hp.	At R.P.M.	At Altitude (ft.)	Octane Fuel	Total dry without hub or starter	lb. per hp.						Diam. Mount. Ring or distance between bearers	Ht. or O.D. (in.)	Length without starter						
Pratt & Whitney Div., United Aircraft Corp. 400 S. Main St. E. Hartford, Conn.	Wasp Jr. B5[3]	A	9	Rad	D	450	2300	2300	91-98	682[1]	1.54	5.18x5.18	985	6:1	157	10:1	.....	46.10	42.43	...	als	op	Sc	Be	..
	Wasp S1H1[4]	A	9	Rad	D	550	2200	8000	91-98	865[1]	1.57	5.75x5.75	1344	6:1	148	12:1	.....	51.80	43.01	...	als	op	Sc	Be	..
	Wasp S3H1-G[5]	A	9	Rad	G-4	550	2200	5000	91-98	865[1]	1.57	5.75x5.75	1344	6:1	148	12:1	.....	51.80	47.81	...	als	op	Sc	Be	..
	Twin Wasp S1C3-G	A	14	RadS	G-5	1050	2550	7500	91-98	1467[1]	1.4	5.5x5.5	1830	6.7:1	178	7.15:1	.....	48.19	61.16	...	als	op	Sc	Be	..
	Twin Wasp D5	A	14	RadS	G-6	1200	2550	6400	100-130	1575[1]	1.3	5.75x5.5	2004	6.5:1	187	7.15:1	.....	49.10	61.02	...	als	op	Sc	Be	..
	Twin Wasp 2SD13-G	A	14	RadS	G-6	1200	2550	5000	100-130	1595[1]	1.3	5.75x5.5	2004	6.5:1	187	7.15:1[2]	.....	49.10	61.02	...	als	op	Sc	Be	..
	Twin Wasp E1 [9]	A	14	RadS	G-7	1300	2600	8000	100-130	1870[1]	1.5	5.75x6	2180	6.7:1	182	7.0:1	.....	54.00	75.80	...	als	op	Sc	Be	..
	Double Wasp CA3[6]	A	18	RadS	G-8	1800	2600	6000	100-130	2317[1]	1.3	5.75x6	2804	6.75:1	196	7:15:1	.....	52.80	78.40	...	als	op	Sc	Be	..
	Double Wasp CA17[7]	A	18	RadS	G-8	1800	2600	6500	115-145	2350[1]	1.3	5.75x6	2804	6.75:1	196	7.29:1[2]	.....	52.80	78.40	...	als	op	Sc	Be	..
	Double Wasp CB1	A	18	RadS	G-8	1900	2600	7000	115-145	2357[1]	1.3	5.75x6	2804	6.75:1	205	7.29:1	.....	52.80	81.40	...	als	op	Sc	Be	..
	Double Wasp CB12[8]	A	18	RadS	G-7	1800	2600	8500	100-130	2390[1]	1.3	5.75x6	2804	6.75:1	196	7.29:1[2]	.....	52.80	81.40	...	als	op	Sc	Be	..
	Wasp Major TSB3-G	A	28	RadS	G-9	2650	2550	5500	115-145	3482[1]	1.3	5.75x6	4363	7:1	188	6.375:1	.....	54	96.75	...	als	op	Sc	Be	..
	Wasp Major B13	A	28	RadS	G-10	2650	2550	6000	115-145	3520[1]	1.3	5.75x6	4363	7:1	188	6.95:1[2]	.....	54	101	...	als	op	Sc	Be	..
Ranger Aircraft Div., Fairchild Engine & Airplane Corp. Farmingdale, L. I., N. Y.	6-440C-2	A	6	id	D	175	2450	SL	65	382	2.18	4.12x5.5	441	6:1	128	.....	17.875	33.50	53.16	.49	s	BG	Sc	Be	op
	6-440C-5	A	6	id	D	200	2450	SL	87	382	1.91	4.12x5.5	441	7.5:1	146	.....	17.875	33.50	53.16	.44	s	BG	Sc	Be	op
	SGU-770C-1B	A	12	id	G-2	450	3000	12,000	91	759	1.46	4x5.12	773	6.5:1	169	9.5:1	13.375	34.13	66.45	.49	s	AC	Sc	Be	op
	SGV-770C-2A	A	12	id	G-2	500	3150	9000	100	757	1.37	4x5.12	773	6.5:1	171	8.84:1	13.375	34.13	66.45	.59	s	BG	Sc	Be	op
	SGV-770D-1	A	12	id	G-11	565	3300	8000	100	855	1.38	4x5.12	773	6.5:1	181	7.04:1	13.375	31.11	74.95	.54	s	BG	Sc	Be	op
	SGV-770D-4	A	12	id	G-12	465	3200	13,500	100	896	1.56	4x5.12	773	6.5:1	173	10.12:1	13.375	36.75	77.24	.54	s	BG	Sc	Be	op
Wright Aeronautical Corp. **Wood-Ridge, N.J.**	967C7BA1	A	7	Rad	G-13	700	2400	5000	91-98	1015	1.28	6.125x6.132	1300	6.2:1	178	7.21:1	26.36	50.45	48.12	.46	als	op	AB	Be	op
	736C9HD3	A	9	Rad	G-13	1275	2500	3500	100-130	1376	.95	6.125x6.875	1820	6.8:1	221	7.2:1[2]	28.75	54.95	49.10	.45	als	op	Sc	Be	op
	740C9HD1	A	9	Rad	G-13	1275	2500	3500	100-130	1368	.94	6.125x6.875	1820	6.8:1	221	7.2:1	28.75	54.95	49.10	.45	als	op	Sc	Be	op
	964C9HD1	A	9	Rad	G-2	1000	2300	6500	91-98	1360	1.2	6.125x6.875	1820	6.3:1	189	7.21:1	28.75	54.95	49.10	.44	als	op	Sc	Be	op
	961C9HE1	A	9	Rad	G-14	1275	2500	3500	100-130	1398	.91	6.125x6.875	1820	6.8:1	221	7.21:1[2]	28.75	54.95	48.50	.45	als	op	AB	Be	op
	959C9HE1	A	9	Rad	G-14	1275	2500	3500	115-145	1398	.91	6.125x6.875	1820	6.8:1	221	7.21:1[2]	28.75	54.95	48.50	.45	als	op	AB	Be	op
	955C9HE1	A	9	Rad	G-14	1275	2500	3600	100-130	1413	.99	6.125x6.875	1820	6.8:1	221	7.21:1[2]	28.75	54.95	48.50	.45	als	op	AB	Be	op
	745C18BA3	A	18	RadS	G-14	2000	2400	4800	100-130	2780	1.2	6.125x6.312	3350	6.5:1	197	6.46:1[2]	62.5	55.78	76.26	.46	als	op	Sc	Be	op
	749C18BD1	A	18	RadS	G-14	2100	2400	4400	100-130	2884	1.03	6.125x6.312	3350	6.5:1	206	6.46:1[2]	40.75	55.62	78.52	.45	als	op	Sc	Be	op
	836C18CA-1	A	18	RadS	G-7	2300	2600	....	115-145	2848	1.06	6.125x6.312	3350	6.5:1	221	6.46:1[2]	.....	55.62	81.9	.43	als	op	AB	Be	op
	C18DA-1	A	18	RadS	....	3250[9]	2900	....	.....	....	....	.....	....	.....	...	.....	.....	.....	.....	...	...	..	..	..	..

A--aircooled
AB--Bosch
AC--AC Spark Plug
al--aluminum and cast iron
als--aluminum and steel
Au--Auto-Lite
Be--Bendix
BG--BG Corp.
Ch--Champion
cps--cylinders parallel to shaft
D--direct drive
DR--Delco-Remy
Ei-Eisemann
Ex--Ex-Cello-O
ho--horizontally opposed
id--inverted
MS--Marvel Schebler
op--optional
Rad--Radial
RadS--staggered radial
s--steel
Sc--Scintilla
SL--sea level
vo--vertically opposed

G1-- .632:1
G2-- 3:2
G3-- 77:120
G4-- .667:1
G5-- .5625:1
G6-- 2:1
G7-- .4375:1
G8-- .450:1
G9-- .375:1
G10- .425:1
G11- .606:1
G12- .458:1
G13- 16:9
G14- 16:7

* Includes starter and other accessories.
1 Includes standard accessories but no starter
2 Low impeller gear ratios are shown. High impeller ratios are: 9.52:1 for P & W 2SD13-G; 9.10:1 for P & W CA17; 9.1:1 for P & W CB12; 9.07:1 for P & W B13; 8.69:1 for Wright 736C9HD3, Wr 961C9HE1, 959C9HE1, and 955C9HE1; 8.67:1 for Wr 745C18BA3, 749C18BD1 and 836C18CA-1.
3 Wasp Jr. B4 has same performance but is designed for use with crankshaft in vertical plane.
4 Wasp S1H1-G has same performance as S1H1 but has .667 prop reduction gear and dry weight 953 lb.
5 Wasp S3H1 has same performance as S3H1-G but has direct drive and 865 lb. dry weight; S3H2 has same performance as S3H1-G, direct drive, 865 lb. dry weight, but is designed for operation with the crankshaft in the vertical plane.
6 Double Wasp CA5 has same normal rated hp. as CA3, but has an additional 200 hp, for takeoff.
7 Other engines in the Double Wasp series similar to the CA17 are the CA15, CA18 and CA19.
8 Double Wasp CB13 has 1900 normal rated hp. at 2600 rpm at 7000 ft.
9 Takeoff hp. shown.



Here are the 36 places on transport planes where Pesco PRECISION Equipment is used

Ever since manual operation of aircraft mechanisms became inadequate, Pesco has been specializing in building fuel and hydraulic equipment for America's commercial and military planes.

From the days of the first hydraulic pumps to today, when you will find Pesco equipment in 36 places on our large air liners, the design and construction of this equipment has been guided by the exacting requirements of the aircraft industry. Because plane performance and human lives have been at stake, there has been no compromise with top quality and performance.

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2. Propeller feathering pump.
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5. Electric motor-driven hydraulic pump.
6. Hydraulic pressure relief valves.
7. Hydraulic flow equalizer.
8. Pressure reducing valve.
9. Engine-driven fuel pump.
10. Motor drive fuel transfer pump.
11. Fuel Booster pump.
12. Engine-driven vacuum pump.
13. Oil separator.
14. Suction relief valve.
15. Air pressure relief valve.
16. Electric Motor for Cabin ventilator.
17. Cabin heater fuel pumps.

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ing non-production workers, to nearly 245,000.

All major aircraft centers except Connecticut expect to hold or raise their employment. Heaviest hiring will be in Los Angeles and San Diego, where there have been lay-offs, and in Dallas, new home of Chance Vought.

The availability of aircraft labor varies by areas both as to general supply and types of skills. Generally speaking, however, there is a shortage in the technical skills—engineers, tool and die makers, designers and others used in the tooling up process. Situation has eased on production-line jobs—tool grinders, lathe operators, etc.—many of them coming from other metalworking industries.

▶ **Wage Rise**—As in other industries, aircraft wages rose sharply last year in the third round of postwar wage increases. Average hourly earnings jumped from $1.40 to about $1.54 in aircraft and parts and from $1.46 to more than $1.61 in engines. Weekly take-home went up even more as employes worked more hours each week.

Weekly hours in aircraft and parts rose from 39.4 to 40.8. In engines, they went up from 40.6 to 41.2.

▶ **Wages Keep Rising**—Overall, wages will keep rising this year, but it will be more gradual. The unions are giving more attention to pensions and other social security benefits now that the sliding cost-of-living index has dampened their chances of getting much higher wages.

Analysis of labor supply conditions in major aircraft centers, prepared by Miss Gladys Fielding of the USES staff, shows the following situations at the end of the year:

• **Los Angeles**—Demand for skilled technical workers—stress analysts, aerodynamists, mathematicians and physicists. Nationwide recruiting for aeronautical engineers not successful. Few job opportunities for unskilled and semi-skilled workers.

• **San Diego**—Demand for skilled workers will be filled from temporary lay-offs. Surplus of production workers will be exhausted by summer.

• **Seattle**—Except for skilled draftsmen, engineers and mechanics, needs are being met locally.

• **Dallas**—Local workers entering aircraft for the first time and workers from other areas, including transfers from Bridgeport, are filling most of the jobs open.

• **Fort Worth**—Urgent demand for experienced aircraft workers, including engineering designers, aeronautical engineers and tool designers. Some engineers are being recruited from outside Fort Worth. A midwinter rise in unemployment is temporarily easing the tight labor market.

• **Wichita**—Most urgent demands are

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Capacity: 20 gph at 20 psi. Weight: 18 ozs. Overall length: 6½"

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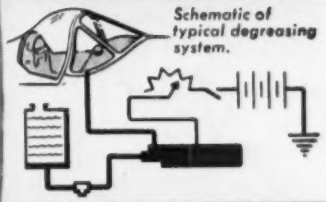

Schematic of typical degreasing system.

SPECIAL PUMP WITH BUILT-IN ADJUSTABLE BYPASS RELIEF
Capacities: 25—60 gph. Radio Noise Filter Optional. Weight: 3.3 lbs.

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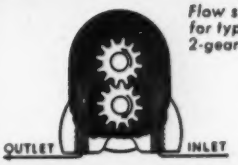
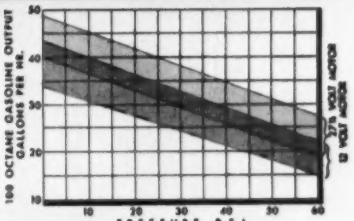


Flow schematic for typical 2-gear pump.

A HIGHLY EFFICIENT, LIGHTWEIGHT HEATER FUEL OR ANTI-ICING PUMP
Nominal Capacity: 30 gph. Overall length: 6⅞". Weight: 2.25 lbs.

18470



Performance curve for Adel pumps Nos. 18470-2, -4, -5.

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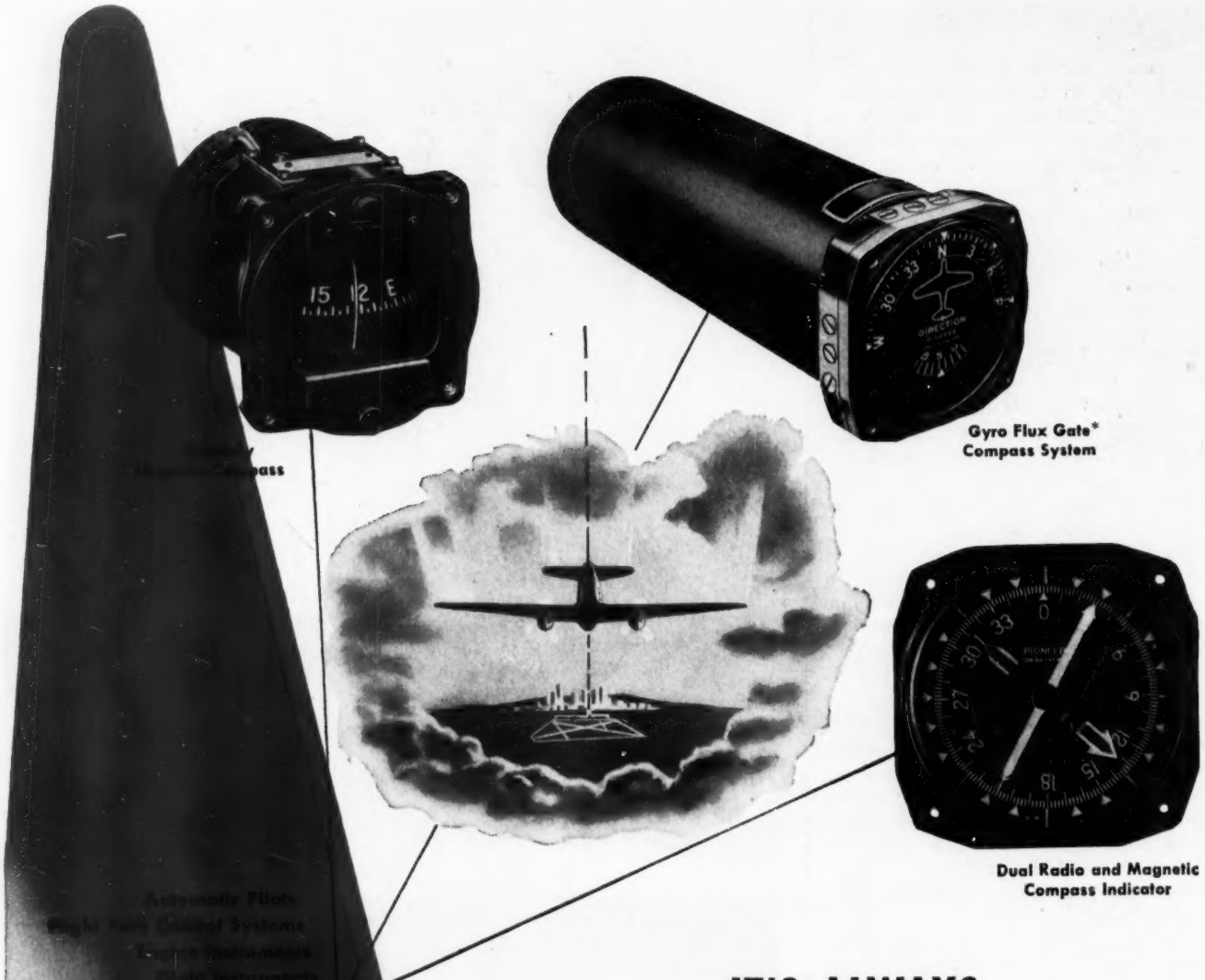

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for tool planners, tool designers, production planners, aeronautical, mechanical and electrical engineers. Workers continue to come into the Wichita area, but the proportion of skilled workers is too low to meet demands. Meanwhile, the pool of lesser skilled workers seeking jobs increases.

• **Newark**—Supply of workers with necessary aircraft skills is decreasing. Number of qualified draftsmen, skilled metalworkers and patternmakers is insufficient.

• **Patterson**—Many jobs are open for skilled and semi-skilled men such as machinists, welders, lathe operators, internal grinder operators, etc. Part of demand is being met by return of former employees leaving other jobs paying less money and from workers recently laid off in other industries.

• **New York**—Large labor supply available for any foreseeable aircraft expansion. Finding specific skills would be only possible problem.

• **St. Louis**—No critical shortages. Some qualified workers have been laid off. A few skills, such as tool and die makers and skilled machinists, are still scarce, but the demand is lessening.

• **Bridgeport**—Layoffs continue. Surplus of experienced workers increases.

• **Hartford**—Small aircraft expansion needs—clerks, machine operators, laborers—are being met without difficulty.

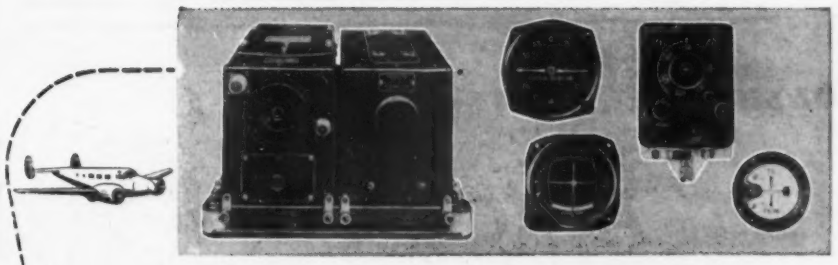
UAW and IAM Battle for Workers

Two big unions—Walter P. Reuther's 1 million-member CIO Automobile, Aircraft and Agricultural Implement Workers and the 650,000-member International Assn. of Machinists (Ind.)—continue to be chief rivals in the aircraft industry.

During the almost three years he has been president of UAW-CIO, Reuther has had little success in cutting down the decided edge held by the older IAM. The IAM, off to an early start in the industry long before the CIO was born in 1936, claims to represent about 75 percent of the more than 150,000 production workers.

► **Battles Last Year**—Bitter battles were fought between the two unions last year at Ryan Aeronautical and Consolidated Vultee in San Diego and at Glenn L. Martin near Baltimore. UAW-CIO held its ground at Ryan and Martin and almost turned the IAM out at Consolidated Vultee.

The IAM ran into trouble at Boeing in Seattle, where it has its largest membership. The AFL Teamsters moved in during a five-month strike and want to take over the bargaining rights for more than 15,000 employees.



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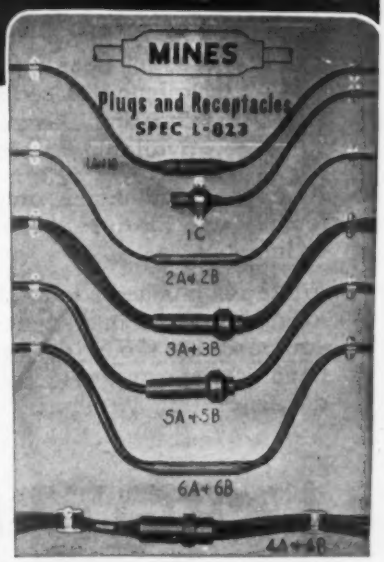
1C	2E125F1A FEMALE RECEPTACLE—Same electrical specifications as above.
2A & 2B	1A187M MALE PLUG and 1A187F FEMALE RECEPTACLE (joined)—Single conductor—25 ampere . . . 1500 volts to ground.
3A & 3B	S2242 MALE PLUG and S2241 FEMALE RECEPTACLE (joined)—Five conductor, two 15 and three 6 ampere—600 volts between contacts . . . 1500 volts to ground.
5A & 5B	2D125M MALE PLUG and 2D125F1 FEMALE RECEPTACLE (joined)—Two conductor—20 ampere—600 volts between contacts . . . 1500 volts to ground.
6A & 6B	1X187M MALE PLUG and 1X187F FEMALE RECEPTACLE (joined)—Single conductor—25 ampere . . . 5000 volts.
4A & 4B	6-187KM2A MALE PLUG and 6-187KF1A FEMALE RECEPTACLE (joined)—Six conductor—25 ampere—600 volts between contacts . . . 1500 volts to ground.



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Both unions operate on an industrial basis. That is, they try to sign up all employees, regardless of the job, skill or craft. Nurses, office workers, sweepers, production workers, skilled mechanics—all are eligible. Under the Taft-Hartley law, both unions have encountered trouble with AFL craft unions, like the electricians, which try to get separate bargaining rights for their crafts.

▶ **Conservative IAM**—The IAM is an old-line, conservative AFL union. It has been in and out of the AFL several times because of jurisdictional difference with the carpenters over millwrights. Unlike UAW-CIO, the IAM does not have a separate department for aircraft, although it has "aeronautical lodges" at aircraft plants.

IAM President Harvey W. Brown must retire on June 30 under the IAM retirement-at-65 plan. He will get a $300 monthly pension.

▶ **Stepped-Up UAW-CIO**—Aircraft organization activity has been stepped up under Vice President John W. Livingston, director of the union's aircraft department. More than $66,000 was spent on aircraft organization during the last fiscal year, compared with less than $20,000 the previous year.

Reuther's anti-Communist administration has had complete control of the union since the last convention in November, 1947. But another fight is brewing for the next gathering in Milwaukee on July 10. Two groups, one pro-Communist, oppose Reuther.

Strikes

Sources in the Labor Dept. expect that, as the aircraft program spreads, the number of strikes and workers idled by them will increase. Tendency will be for union negotiators to "get tough" if aircraft manufacturers deny wage increases which they feel the companies can afford to pay on their government contracts.

In this connection, it is interesting to note that the number of strikes in aircraft has decreased every year since 1944 when the production of airplanes started downward. Conceivably, then, they would increase on the upswing.

Here are BLS strike figures for aircraft, parts and engines:

	Number of Strikes	Workers Involved	Man-days Idleness
1944	103	190,000	385,000
1945	85	150,000	581,000
1946	15	21,000	557,000
1947	10	3,500	67,900

Figures for 1948 are not yet available, but the number of strikes should be less than the 10 last year.

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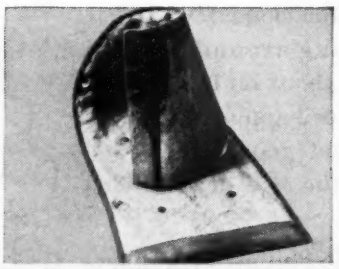
Type G completely sealed Thermoflex Insulation Blanket for a jet engine exhaust cone.

NOW A COMPLETELY sealed flexible blanket having outstanding insulating properties has been produced by Johns-Manville Research for jet engine exhaust cones, turbine casings, tail pipes and guided missile use.

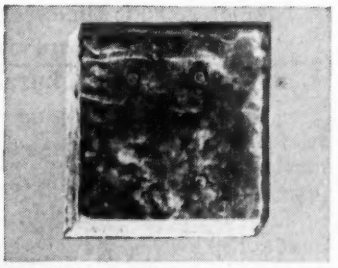
This new Thermoflex Insulation Blanket is exceptionally light in weight. Improved production techniques permit weights as low as 0.30 pounds per square foot and up. Yet at 800°F mean temperature, the conductivity of the Thermoflex Felt (4 lb. per cu. ft. density) is only 0.76, expressed in Btu in. per hour per square foot per degree F. The finished blanket has a felted amosite asbestos pad (Thermoflex Felt) fully sealed on both sides by Inconel or stainless steel metal foils.

All Thermoflex Blankets are custom-made. In addition to the completely sealed blanket (type G), they are also available with a foil on one side only to guard against penetration of oil from the cold face (type C) and in a special design for guided missiles (type CM). Each of these three basic types is available in special shapes for heat exchangers, tail pipe clamps, inner exhaust cone discs, and to protect vital equipment in the hot zone.

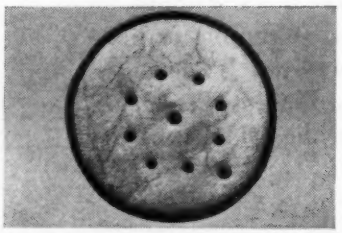
For further information write Johns-Manville, Box 290, New York 16, N. Y.



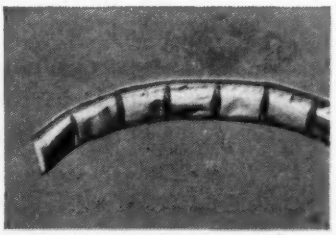
Type C Thermoflex Blanket for use where a seal is required only on outside of blanket. Construction (layers): Aluminum screen, aluminum foil, knitted Inconel mesh, Thermoflex Felt, knitted Inconel mesh.



Type CM Thermoflex Blanket for guided missiles. Construction (layers): Knitted metal mesh, aluminum foil, Thermoflex Felt, knitted metal mesh.



A special type Thermoflex Blanket Pad assembly for jet engines. Construction (layers): Knitted Inconel mesh, Thermoflex Felt, knitted Inconel mesh.



Section of Type G Thermoflex Blanket for turbine casing. Construction (layers): Monel screen, Inconel or stainless steel foil, Thermoflex Felt, Inconel or stainless steel foil.

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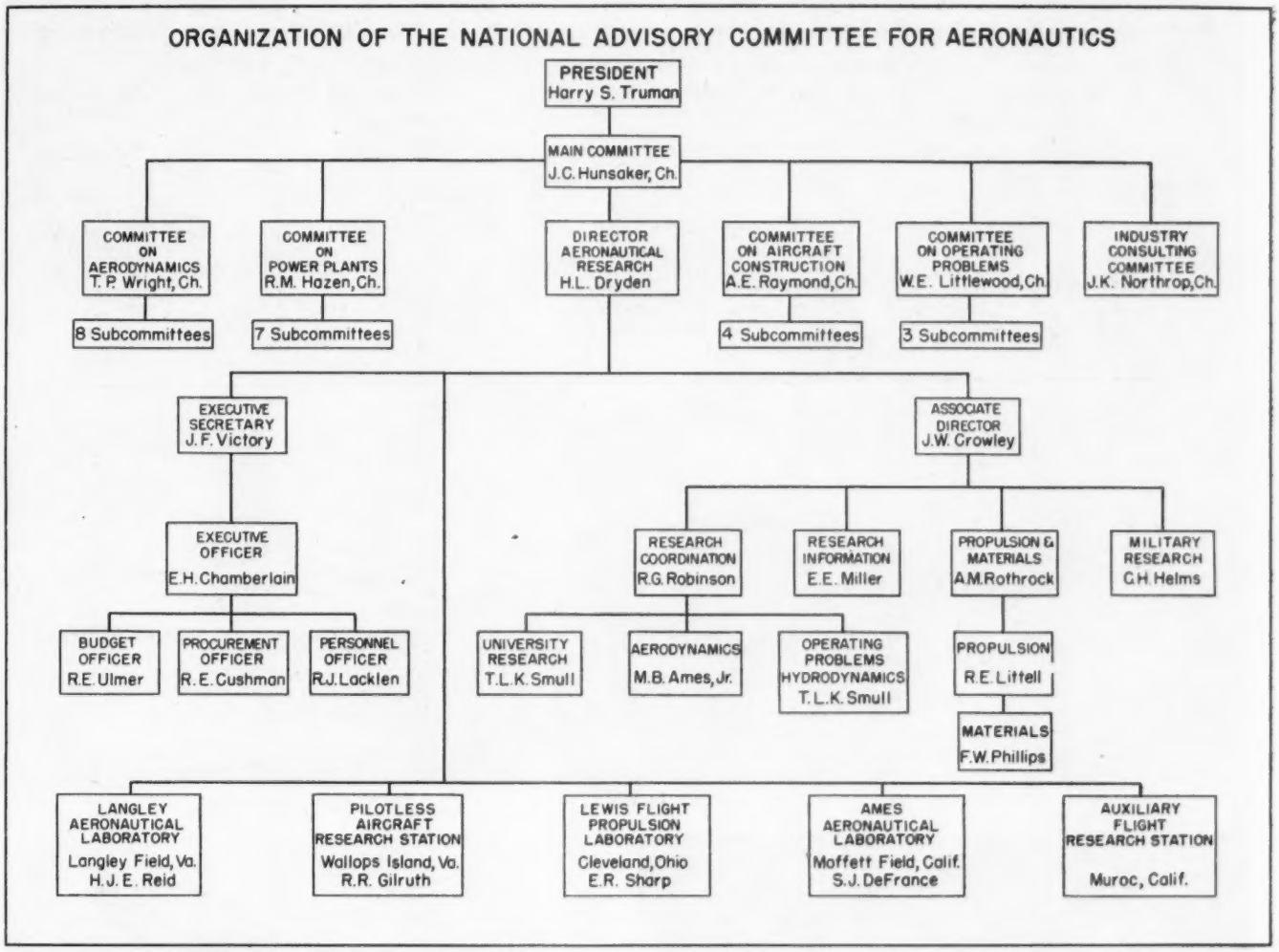


Air Power Strength Starts in the Laboratory

U. S. has aeronautical leadership through research effort that has had to expand as well as catch up.

By Robert McLarren

U. S. aeronautical science has reassumed world leadership in the new realm of high speed flight, a leadership it came perilously close to losing irretrievably during World War II. But presently available knowledge, together with the high productivity level of current programs, permits our scientific executives to assure the citizen of our superiority in this field over the world.

This leadership was not gained through the simple process of "catching up" lost ground, which can often be accomplished through sheer increase in effort. Simultaneously, U. S. aeronautical research found itself racing over a continually expanding distance, a near-impossible combination of a sprint and an endurance race. The original lost distance has been covered many times over since V-J-Day but even today aeronautical science finds itself facing an ever-receding goal.

► **Not Unique**—Only comfort in this frustrating situation is that it obtains, too, in Soviet Russia, which has neither the experienced technical knowledge nor the freedom of scientific direction enjoyed here. U. S. aeronautical research leaders admit little or no knowledge of the scope, direction or capability of the Russian aeronautical research effort.

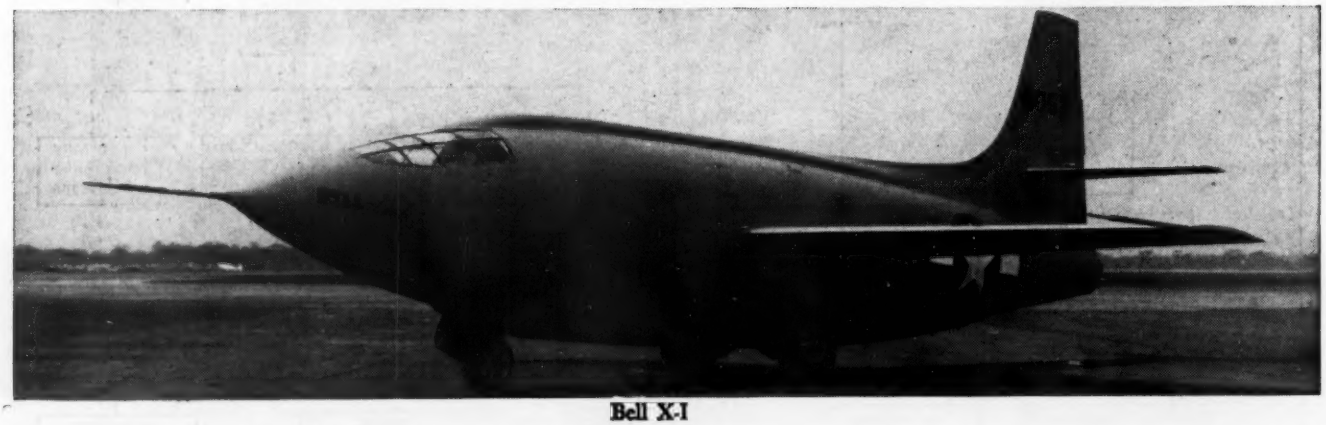
The conclusion that the U. S. leads is based of necessity on a simple examination of the monumental problems now being faced and the quality and quantity of manpower and equipment required for their solution.

The location and present capacity of the world's leading aeronautical scientists—and their number is surprisingly small—is well known both here and abroad and while this is only an approximate index to the productivity of research effort, past experience indicates that such an approach to the problem of "rating" various nation's scientific importance is fundamentally sound. A factor of equal importance is the magnitude and quality of research equipment in which there exists no doubt that the U. S. stands several years ahead of the money-starved, war-ravaged remainder of the world.

► **In the Dark**—But this leadership is a tenuous thing. It can be lost overnight, threatened without knowledge of the menace and destroyed in a blind alley of effort into which only constant scien-

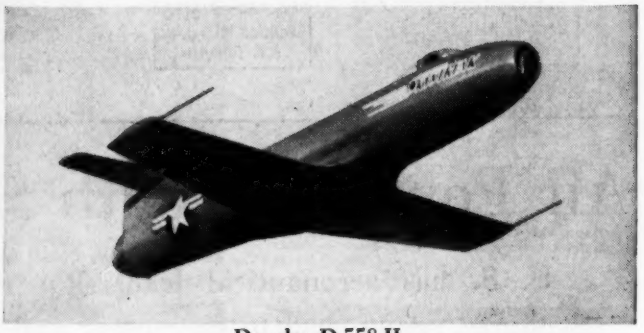
U. S. High Speed Research Airplanes

Manufacturer	Designation	Engine	Span	Length	Height	Gross Weight	Max. Design Speed
Bell	X-1	Reaction Motors rocket 6000 lb. thrust pressure fuel system	28′	31′	10′ 10″	13,069	1000 mph. @ 60,000 ft.
Bell	X-1A	Reaction Motors rocket 6000 lb. thrust turbine fuel system	28′	31′	10′ 10″	13,400	1700 mph. @ 80,000 ft.
Bell	X-2	Curtiss Propeller rocket	Swept wing, stainless steel				2250 mph. @ 100,000 ft.
Douglas	X-3	Various	Design studies only				2500 mph. @ 200,000 ft.
Northrop	X-4	(2) Westinghouse 19XB2B 1600 lb. thrust ea.	25′	20′	15′	7,000	650 mph. @ 10,000 ft.
Douglas	D-558-I	G E Allison J-35 4000 lb. thrust	25′	25′	12′	10,000	650 mph. @ seal level
Douglas	D-558-II	Westinghouse 24C, 3000 lb. and Reaction Motors rocket 6000 lb. thrust	25′	45′ 3″	11′ 6″	16,000	1820 mph. @ 75,000 ft.



Bell X-I

Douglas D-558-I



Douglas D-558-II

Northrop X-4

AIR-BORNE SELF-STARTER FOR JETS

A successful air-borne, self-starting system for jet and turboprop aircraft engines was recently announced by the Navy's Bureau of Aeronautics.

Developed and manufactured by AiResearch, this device makes it possible to start jet and turboprop aircraft without the use of a jeep-drawn trailer of storage batteries, 250-lb. generator and ground crew. The new system saves valuable time, equipment and personnel and allows such aircraft to be started anywhere, any time, and under any conditions.

Heart of the new self-starter system is a newly developed 88-lb. multi-purpose auxiliary gas turbine—the first radial *inward flow* power turbine of the air or gas type ever perfected. It is the *first* auxiliary gas turbine of *any type* to pass gruelling 200-hour government qualification tests. Combustion temperatures as high as 1600° F and wheel speeds as fast as 40,000 rpm make possible its very high ratio of power for weight and size.

• AiResearch engineers, designers of rotors operating in excess of 100,000 rpm, invite your toughest problems involving high-speed wheels. Specialized experience is also available in creating compact turbines and compressors; actuators with high-speed rotors; air, gas and fluid heat exchangers; air pressure, temperature and other automatic controls.

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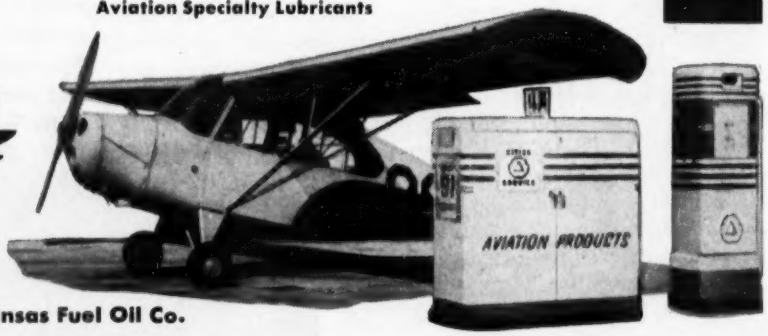

Aeronautical Research Budget

Agency	Fiscal 1949	Fiscal 1950
Air Force	$224,436,790	$215,000,000
Navy Bureau of Aeronautics	109,681,944	80,000,000
NACA	37,810,000	48,700,000
Ordnance Dept.–Army	45,624,120	47,125,000
Bureau of Ordnance–Navy	67,568,050	62,180,000
CAA	1,800,000	1,800,000
TOTAL	$486,920,904	$454,805,000

tific vigilance can throw light. For these reasons, anything less than a constant acceleration of research effort is to be viewed as a grave national risk, for the effects of a slackening of research effort are obscured for as long as five years—and then it is too late.

It is the emergence of the aircraft from its subsonic cocoon to its supersonic freedom that has created the tractless problems of aeronautical science. A research result that increases an airplane's speed 50 mph. simultaneously breeds a dozen new problems demanding solution. These solutions, in turn, multiply themselves into a welter of problems that can be solved only by isolating a miniscule portion and attacking it with concentration.

▶ **Task Force**—Aeronautical research is conducted most efficiently by a small "task force" of specialists. First, is the theorist who attacks the problem by mathematical methods that isolate the direction of approach. Next comes the research engineer who tests these theories in the wind tunnel or the special facility required to provide the conditions of operation demanded. Third comes the design engineer who interprets these research results into a specific aircraft design.

Last comes the user, the Air Force, Naval Aviation or the airline, which evaluates the design in terms of performance, safety and suitability for the job. Then begins the long period of development of the article by the manufacturer and the user, assisted, as required, by new research results. Only in this heterogeneous but closely coordinated way can maximum progress be assured.

The foregoing provides an index to the complexity of the question: "Where do we stand in aeronautical research?"

Our major research problem is aerodynamics, the study of air in motion. The principal difficulty in this field is to obtain an understanding of the transonic zone, lying just below and just above the speed of sound, both areas of which are now fairly well understood.

▶ **Configurations**—In the realm of transonic aerodynamics, science is substantially versed in a number of special configurations required for the production of lift and the reduction of drag. The general design requirements for achieving these ends are through the use of wing sweep, low aspect ratio planforms, lenticular and double-wedge profiles.

But badly needed are the data required for refinement of these configurations to produce the needed minute reductions and increments in design for the last precious points in the coefficients. Configurations are now available that perform such vital roles as minimizing stability and control difficulties at transonic speed but information is lacking on the modifications needed to extend this narrow range of usefulness to encompass landing and maximum speeds.

Drag data are available on individual components of aircraft and missiles at transonic speeds, and information is available for the design of minimum drag forms of these components. But research is badly needed on methods of calculating the total drag of these components when placed in combination, such as the completed aircraft or missile ready for flight. Interference between these components creates extremely complex airflow patterns that defy analysis to accurate degrees. These studies require high speed wind tunnels of large size and power requirements and highly accurate methods of measurement of variations in energy in the airflow.

▶ **Stability Progress**—Stability and control theory has shown remarkable progress in the past year made possible by advanced mathematical methods developed during the period, and the use of special calculating equipment. However, much of the actual design data must still be extrapolated by methods of widely varying accuracy to full-scale parameters. Of enormous help in this program has been the piloted high speed flight research program.

The Bell X-1 has already provided a tremendous quantity of helpful data on stability and control at transonic speeds, and the continuation of this overall program is one of the primary hopes of solution of these problems.

The problems of internal aerodynamics are still complicated by the familiar difficulties of boundary-layer

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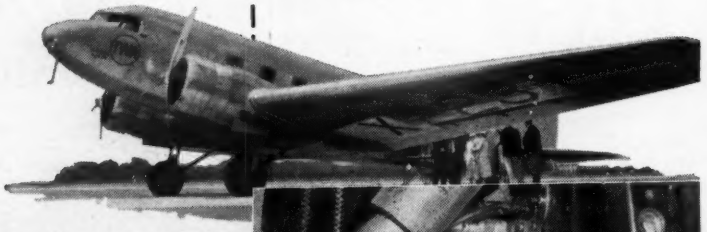

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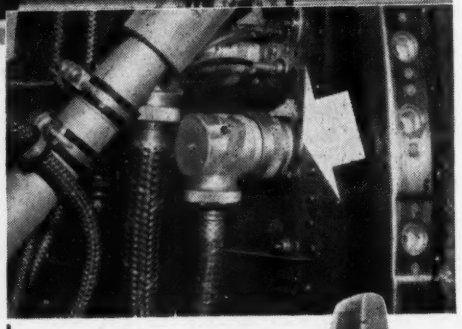

Firewall 90° Plug on DC-6

DC-6

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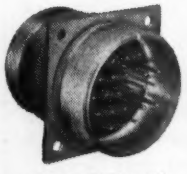
Shown in the new AN7-1248 Bulletin and KS-1 Supplement to the K Bulletin. Address Department B-110.



FW00 (AN3100) Receptacle Steel Shell

FW08 (AN3108) Steel Shell

FW06 (AN3106) partially exploded showing special alloy crimp-type contacts, steel barrel and end-bell

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analysis. Nose inlets are now fairly well understood with research data already reduced to the form of design charts. Wing inlets, particularly in the root section, are not so thoroughly analyzed but considerable effort is being directed to these problems due to their importance on pressure recovery and its large effect on power plant performance.

▶ **Structures**—Structural research problems apparently multiply with each solution due to the simple fact that structural loads are growing higher while wing dimensions are growing smaller. If present knowledge was suddenly sealed off, it is obvious that these converging lines of development would soon merge into an impossible situation.

It is the current aim of structural research to keep these two lines apart by providing stronger materials and structures of greater density. Substantial progress has been shown in theoretical work along these lines but a broad gap remains between available data and actual application to the fabrication of new raw stock and completed aircraft structures.

Great effort is presently being expended in research on panel buckling, loads at permanent buckling, vibration, pressure cabins, plastics, low-density materials, stiffeners on girders, tension field beams, flutter, rib stiffeners, end-fixity of stiffeners, skin stiffener panels, cutouts, lightening holes, general instability of shells, shear lag and methods of reduction of test data to standard.

New fabrication methods have already been introduced for tapered skin sheets, integral stiffeners, attachment methods and analysis of structures utilizing these forms and shapes.

▶ **Propulsion**—It is probably in the field of aircraft propulsion that the greatest research progress has been shown since VJ-Day. An entirely new family of turbine and rocket powerplants has been thoroughly analyzed and developed with the result that there is now available a huge mass of design data awaiting application.

However, knotty problems continue to exist before this application, principally in the fields of high-temperature alloys. Available research data have charted in great detail the exact benefits to be gained through the use of higher compression ratios and higher combustion heat release, but the application of these data hinges wholly on the outcome of the present battle with heat-resistant materials. Great progress is being made in this battle but the field apparently will require the fabrication of entirely new materials employing ceramics bonded to metals, a science in itself.

Once materials are available capable of withstanding temperatures of 2-3000 F. while simultaneously handling stresses

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JUNIOR AND INTERMEDIATE CATALOG, Bulletin JIB-49, gives full design details and specifications for Verson Junior and Intermediate Series Press Brakes.

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of 50-75,000 psi., then the mass of data on high-performance turbine engines can be applied and specific power outputs will soar.

► **Coordination Achieved**—Much of the apparent lack of coordination between various research activities across the nation has now been resolved. Hundreds of projects of obvious duplicity have been cancelled and their counterparts strengthened. Whole areas of research have been transferred from one agency to another and lines of responsibility are now reasonably and carefully drawn within the limits of workability.

But the best method of coordination still remains the committee form of direction with a dozen or so experts in the field sitting down and threshing out ideas, experiences and proposals which could not possibly be evolved by a single man, or group of men bearing heavy financial and executive responsibilities.

► **Costs**—Research costs continue to soar, not alone due to the general price rise in the nation. As the pursuit of fundamental knowledge of a particular subject begins to lead into narrow, hidden corners of detail, special equipment and techniques are required that are expensive to plan, develop, build and operate.

Often in the past, the range of data desired was discovered to lay entirely within the range of accuracy of the measuring equipment, obviously an impossible situation. Wind tunnel turbulence is a typical example. Until the problem of turbulence measurement was solved it was impossible to develop research data on laminar boundary layer flows.

Aeronautical research in such new sciences as guided missiles, electronic-control, supersonics, etc. has had to work backward and forward at the same time, developing fundamental theory while producing practical design data. Much of this background work now has been accomplished so that the major effort now can be directed towards the production of detailed designs.

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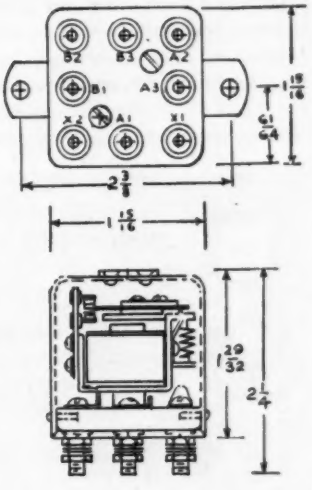

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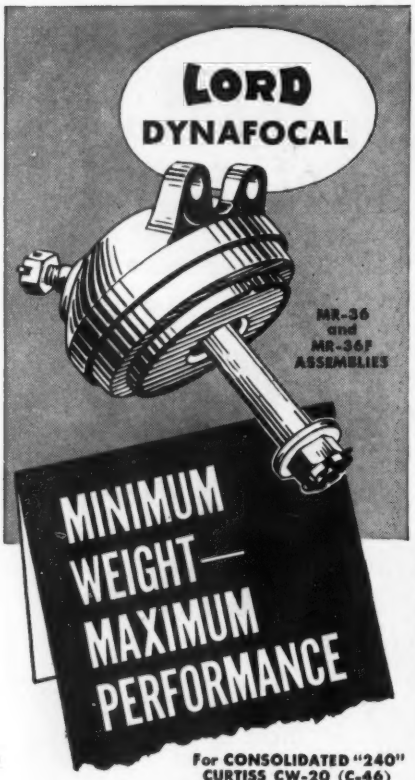

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DOUGLAS DC-6 (C-112)
MARTIN 202

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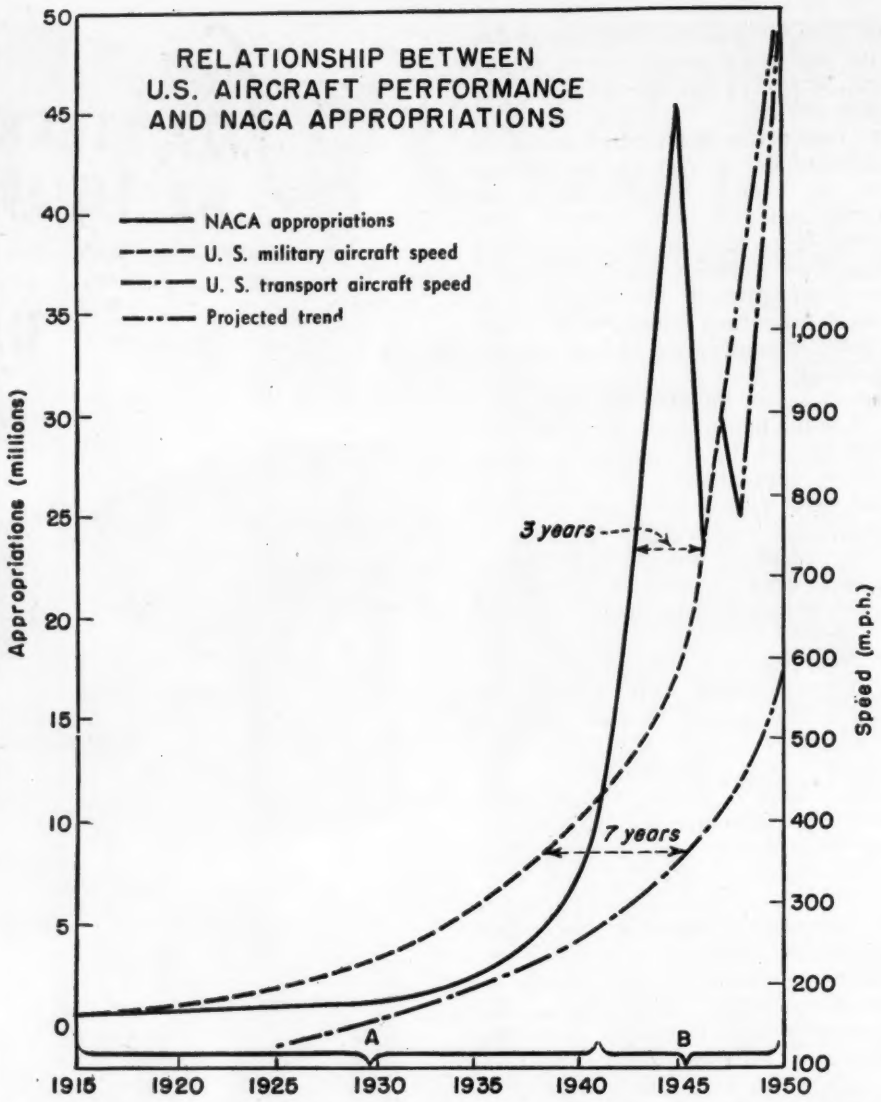


In Area A, basic research funds were low; major attention was to develop research methods. In war and postwar periods, Area B, performance began to parallel expenditures, with the indicated gaps for research to show up as results in plane speed.

High Speed Flight Research

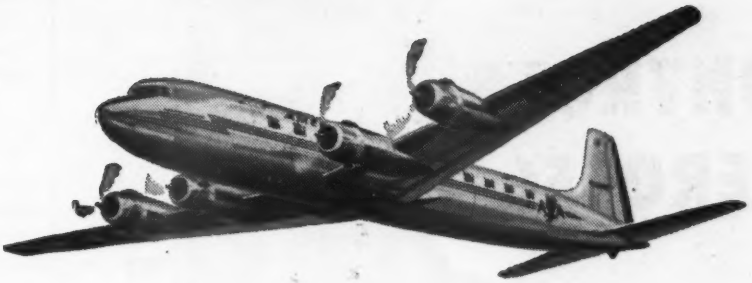
The decision of the U.S. Government in 1944 to undertake a program of piloted high speed flight research was made on the basis of necessity rather than convenience.

First, it had long been suspected that the wind tunnel could not produce accurate results in the vicinity of Mach 1.0, the speed of sound. At this speed a normal shock forms directly across the throat section of the tunnel resulting in a complete breakdown of the airflow and wholly unreliable instrument readings.

▶ **Blank Spot**—It had been hoped that careful design might narrow this "choked" condition to a very narrow band of speed on either side of Mach 1.0 by means of tunnel shape, anti-turbulence screens, etc. But at the time reliable readings were obtained only up to about Mach 0.95 and above Mach 1.15, leaving a band of 0.2 in which no data could be obtained. Yet it was precisely this narrow band that held the greatest interest for aircraft designers.

Another vital factor was that although stability and control data may be calculated and tested under wind tunnel conditions on small models, the conversion of these data to full-scale is not yet an exact science. And stability and control were two of the major questions posed by really high speed flight. Only a pilot in an airplane traveling in the vicinity of Mach 1.0 could properly determine the handling characteristics of the airplane.

▶ **Start of Program**—Based on these two primary problems, together with other questions of structure, power plants, low speed characteristics of high speed



It is still Dawn in Aviation's Day!

... From the inspiration of its miraculous growth comes our faith in the bright future of America's air transportation...

It has been little over 45 years since that day at Kitty Hawk when an American boy named Wright flew 120 feet at the rate of 30 miles an hour.

Since then many famous names—Rickenbacker, Lindbergh, Wiley Post, "Hap" Arnold, "Tooey" Spaatz, Hoyt Vandenberg and scores of others—have written glorious exploits in aviation's logbook.

The Berlin Airlift today proves in peace what the India-China "Hump" proved in war—that air transportation's *utility* is matched only by its *flexibility*.

We of American Airlines have backed our faith in aviation's future with more than words. Within the past three years we have spent $75,000,000 for a completely new postwar Flagship Fleet.

Early 1949 will see the retirement of all DC-3 and DC-4 aircraft on American's routes. These airplanes, in peace and in war, made possible many of transportation's greatest achievements. For years their sturdiness and reliability set new standards in aviation. However, newer and faster planes of even greater dependability have made these earlier types yesterday's airplanes—by the demanding standards of 1949.

American Airlines will enter 1949 with a completely new fleet of Douglas DC-6 and Consolidated Convair Flagships, each a leader in its field. This 300-mile-an-hour Flagship Fleet is ready to serve you with comfort, speed, reliability and safety. This is ample evidence of our faith in the future of air transportation—indeed in the future of America itself.

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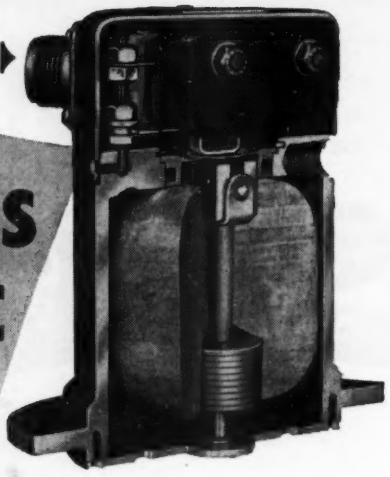

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The quality, in design and engineering, of Aerotec Switches has not changed, it is an accepted fact both by the Army-Navy and manufacturers of commercial planes. The same care that gave these controls outstanding performance records in combat, is used in the manufacture of Aerotec equipment today.

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aircraft, etc., the U. S. Air Force, Naval Aviation, National Advisory Committee for Aeronautics and two carefully selected airframe manufacturers merged their respective talents into a national piloted high speed research program that has since proved eminently successful.

On the basis of wartime NACA research, together with captured German research data available later in the program, there were four major avenues of approach to the problem of really high speed flight: thin wings, swept wings, low aspect ratio wings and high speed wing profiles. The program was laid down to encompass the entire range of these possible solutions: the Navy to handle low aspect ratio and wing sweep, the Air Force to handle thin wings and wing sweep, NACA to handle special wing profiles. One other form, the tailless, was added to the program later.

One after another of the airplanes was completed and test flown and the piloted research program began to show results. The airplanes were designed on the basis of NACA research data by individual industry design teams and sponsored in the form of regular Air Force and Navy airplane procurement contracts. The program was moved to Muroc Air Force Base, Calif., where the hard dry lake bed provides a runway seven miles long, and was administered jointly by Air Force, Navy and NACA.

▶ **Results**—The famed Bell X-1 was the first to be completed and the first to attain supersonic speed, on Oct. 14, 1947. This airplane uses extremely thin wing profile and is rocket powered. Second plane to fly was the Douglas Navy D-558-I, which is turbojet-powered and features low aspect ratio (short, broad) wings. It established a world speed record (since exceeded) of 650 mph. on Aug. 25, 1947. Third to fly was the Douglas D-558-II, featuring a combination of low aspect ratio and wing sweep. This plane features both turbojet and rocket power and observers believe it will prove the fastest airplane ever built.

Latest research airplane to fly is the Northrop X-4, a special Air Force project to examine the stability and control of aircraft flying steadily in the vicinity of sonic speed and to examine the practicality of the tailless swept wing design. Thus, the X-4 will fulfill a dual purpose: it will provide research data as a part of the general program and will also proticality of the tailless sweptwing design. data for specific problems in high speed fighter planes now being examined.

▶ **Yet to Come**—Still to be completed and flown is the Bell X-2, a sweptwing version of the highly successful X-1. Completion of this airplane has been delayed while detailed information became available on the performance of

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In many applications like these	in which these steels are generally used	you will save money by using
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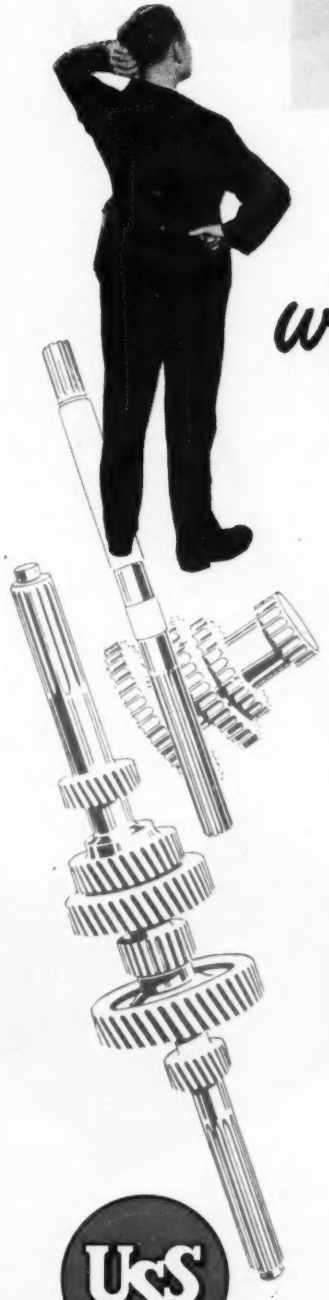

Cut your Costs with U·S·S SUPERKORE *steels*

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U·S·S SUPERKORE Steels are now available in four different grades —each designed for a *specific* type of heavy duty service. Find out where you can apply them to reduce your costs, to simplify inventory and specification details. To guide you in their most economical and practical application, the men who developed SUPERKORE will be glad to assist you. The "Superkore Booklet" will give you further interesting information. You can obtain a copy by writing to Carnegie-Illinois Steel Corporation, Room 2070 Carnegie Building, Pittsburgh 30, Pennsylvania.

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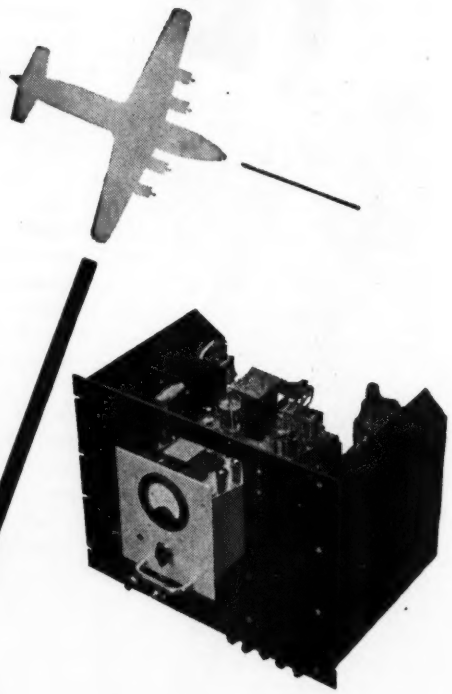

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the X-1, and by delays in the completion of the Curtiss Propeller division rocket motor.

Remaining project is the Douglas X-3, which is still in the preliminary design and layout study stage with more than 60 different designs being completed and studied ranging from short, stubby to long, thin configurations and the complete range of high speed power plants.

So well has the X-1 done its job as a flying research laboratory that the Air Force has ordered a limited production quantity of four airplanes to broaden the program.

Engine Definitions

Here are definitions of the major propulsive systems as used by research men:

• **Gas Turbine**—Any of a family of powerplants which utilize a turbine to take energy from a stream of hot gases for doing useful work external from the machine itself.

• **Turbojet**—Air is drawn in the compressor inlet, compressed to a high pressure, passes through a combustion chamber, where fuel is added and burned and the high temperature products expand through the turbine that drives the compressor and continues to expand through a nozzle as a jet in the atmosphere.

• **Turboprop**—A turbojet engine in which the turbine is geared to drive a propeller. When a portion of the hot gases is ejected through a nozzle, the unit is frequently referred to as a propjet.

• **Compound Engine**—A conventional reciprocating engine to which a steady flow exhaust-gas turbine and an auxiliary supercharger are added. The engine exhaust gas is ducted to the turbine which is provided with a nozzle for jet propulsion. The turbine drives the auxiliary supercharger and the excess turbine power is delivered to the engine shaft through gearing. An intercooler is provided for cooling the engine charge air after the auxiliary compressor.

• **Turboramjet** — A conventional turbojet engine with provisions for reheating the gas between the turbine discharge and the exhaust nozzle. Actually a form of constant thrust augmentation, this combination system makes it possible to obtain higher temperatures in the exhaust jet than can be withstood by the turbine.

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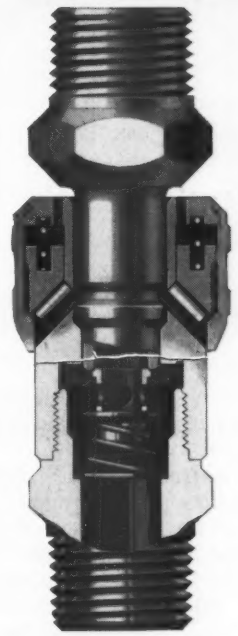

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Business Flying: Civil Backbone of Air Power

Use of four-place planes by commercial travelers often proves the cheapest way to cover a territory.

By Alexander McSurely

The steadily growing number of industrial and commercial companies and individual business and professional men who have learned to use executive aircraft in daily business trips are civil flying's best customers and best prospects in 1949.

A total of 26,590 airplanes were used for business flying in 1947 and flew 1,966,000 hr. as compared to an overall total of 86,380 aircraft flying 16,370,000 hr. last available CAA reports show. Most of these airplanes were used for other purposes as well as business, and most of them were individually owned. An AVIATION WEEK estimate places the total number of corporation-owned aircraft at around 3500.

▶ **Best Salesmen**—Probably the best salesmen for business flying are today's pioneering business men who have found cold economies in having their own air transportation available to carry them where and when they want to go.

A small number of aircraft service operators who have come to appreciate the importance of good customer relations with the top executives who travel in their own planes, makes another plus factor in the expansion of business flying.

But probably the most important item in selling business aircraft is the performance of the airplanes themselves, shortening to a few hours trips which would require days by any surface transportation. Yet, costs in many cases are directly comparable or even less.

▶ **Witnesses**—Some evidence of this is found in testimony by business flyers:

H. R. Berg, Columbia, S. C., management consultant (Beech four-place Bonanza)—I took off from Columbia, and made a trip to Richmond, Va., New York City, Auburn, N. Y., Battle Creek, Mich., Chicago, Lexington, Ky., and returned to Columbia. Total chart mileage, 2060. Total flying time, 13 hr. 18 min. Average ground speed 158 mph., average fuel consumption 9.9 gal./hr. Average altitude 7000 ft. In four days I covered all of this territory which allowed me a full day in New York, half day in Auburn and a full day in Chicago to transact my business. Total cost of trip including insurance, depreciation, fuel and hangar was $69.80. I had one passenger.

Bert Noble, Oakland, Calif., manufacturer (Stinson four-place Voyager)—My Stinson paid for itself in a few months on routine business trips of 50 to 1000 miles. It adds plenty to my leisure time. I travel a comfortable 60,000 miles a year in 11 states and still keep up with my paper work in the office.

Barry Goldwater, owner of Goldwaters, Phoenix, Ariz., specialty store, (Ryan four-place Navion)—We fly weekly between Phoenix and Prescott and twice monthly by Navion to Los Angeles and other marketing centers. Fourteen of our executives pilot the plane. Navion time to Prescott is 40 min. and to Los Angeles 2½ hr. Auto time to Prescott is 40 min., to Los Angeles 10 hrs. Plane is also used for calling on customers at ranches and lodges off highways, and for making home deliveries.

▶ **Survey**—A Geisse-Williams Dept. of Commerce survey on postwar outlook for private flying (1943), which proved remarkably accurate in some of its other forecasts, estimated that approximately 30 percent of commercial traveling could be done by air.

It is calculated that on a basis of 1.5 to 2 billion miles covered by commercial travelers in planes approximately 40,000 to 50,000 planes would satisfy this market.

The estimate was made on a basis of existing commercial travel by auto, and did not consider the additional mileage possible in the same hours of travel because of the higher speed of the plane. The survey indicated there were approximately 250,000 in this group prewar, that they used their cars approximately 500 hrs. a year, and averaged approximately 19,000 mi. a year in travel.

Using the conservative 3-to-1 ratio of business plane speed to automobile speed this would indicate that the average airplane commercial traveler could travel approximately 57,000 mi. a year in the same time, or could cut his travel time to one third, having some 330 hr. additional time to spend on actual business relationships. It is interesting to compare the 57,000 mi./yr. theoretical figure with Mr. Noble's 60,000 mi./yr. report shown above.

Corporation Aircraft Owners Assn., New York, an association of companies operating their own airplanes for business travel, has recently taken on more activity with designation of C. B. Colby as executive secretary. Primary aims of this organization are to study legislation and regulation affecting the group; work with other aviation groups for common interests; exchange information and promote aircraft safety, economy and improvement in designs.

▶ **Sales**—In 1948 the 10 principal personal aircraft producers reported a total shipment of 3565 four place planes and 3404 two-place planes.

An AVIATION WEEK forecast of the 1949 new plane sales is approximately 6000 planes. Approximately 3600 will be four-placers and 2400 two-placers.

The 1947 CAA aircraft use survey showed 31 percent of the planes in operation were used in business flying. This percentage of the 1948 actual and 1949 estimated production would add nearly 5000 business planes to the 26,590 estimated in 1947. However, CAA analysts expect a retirement of planes at the rate of approximately 15 percent a year. If that rate continues the 1948-1949 estimated new production would only hold the level.

Continuing increase in the number of business planes, to which all logical indications point, probably will come about partially through heavier purchases in the used airplane market, and partially through a revision of aircraft use

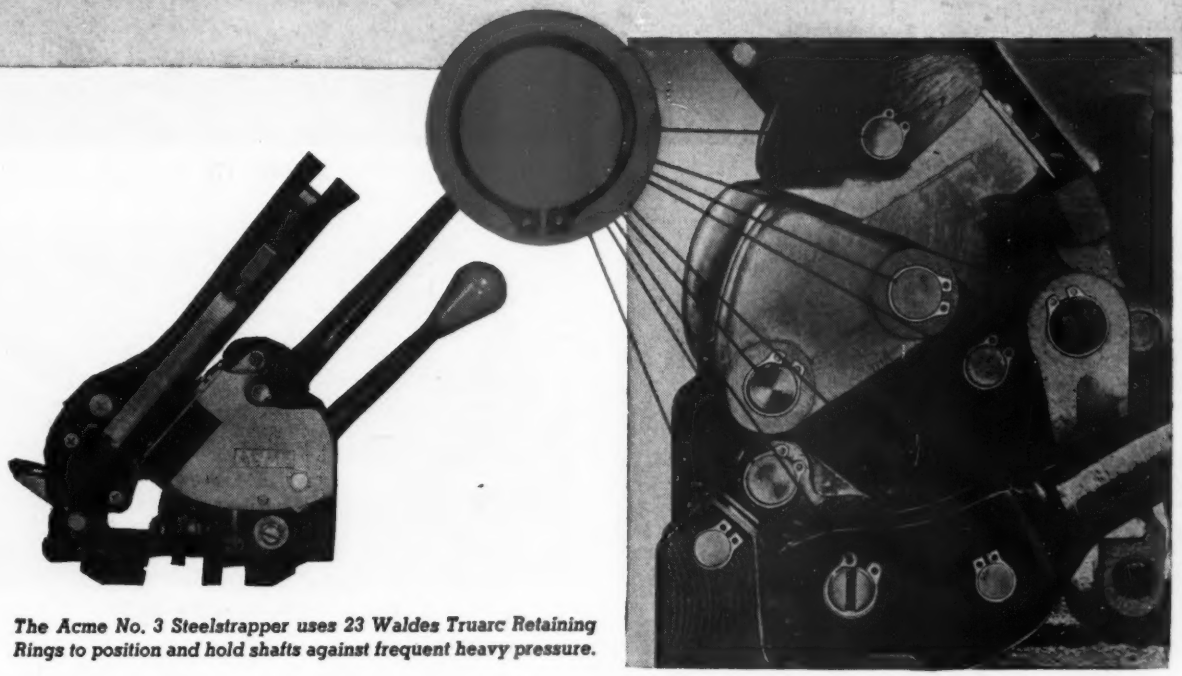
Civil Pilots

CAA estimates approximately 500,000 certificated civil pilots in the U. S. as of Jan. 1, 1949.

Total includes these groups:

Airline transport pilots	10,000
Commercial pilots	210,000
Private pilots	280,000
Total certificated pilots	500,000
Number of student pilot certificates issued in 1948	117,715
Number of private pilot certificates issued in 1948	86,836

23 Truarc rings permit changeover to centerless grinding savings



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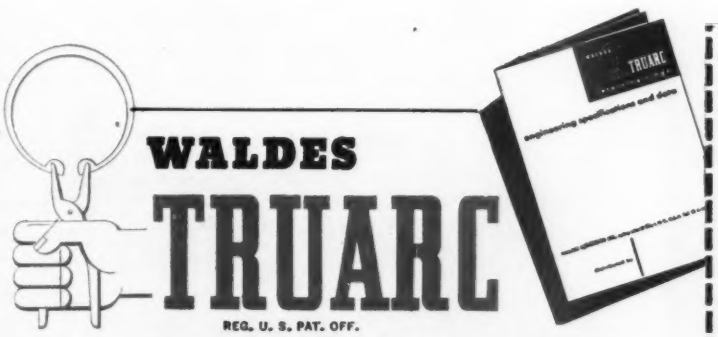

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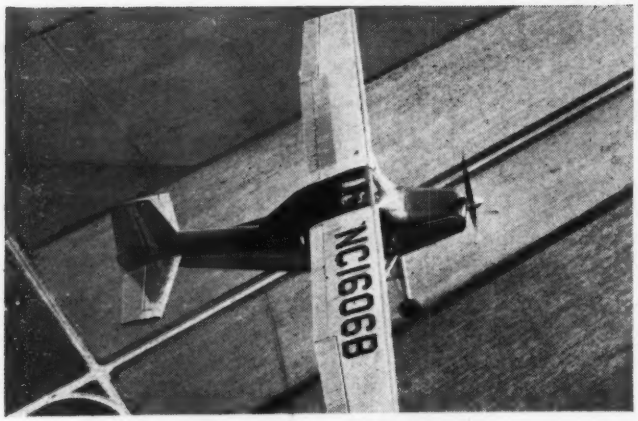
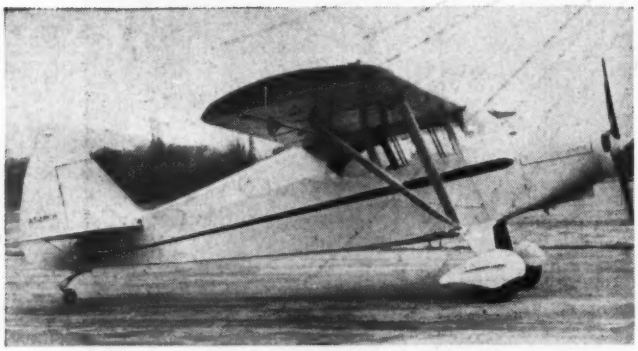


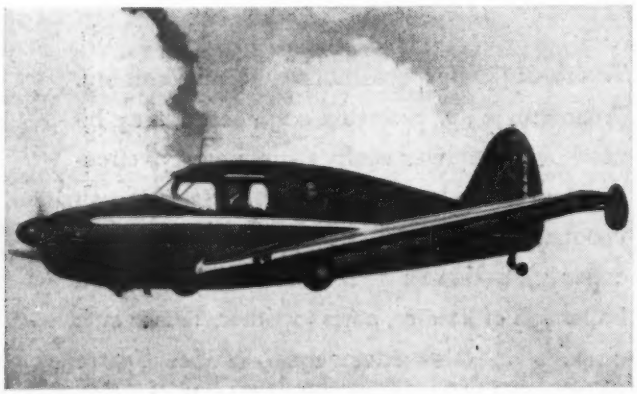
Luscombe Silvaire Sedan

Cessna 170

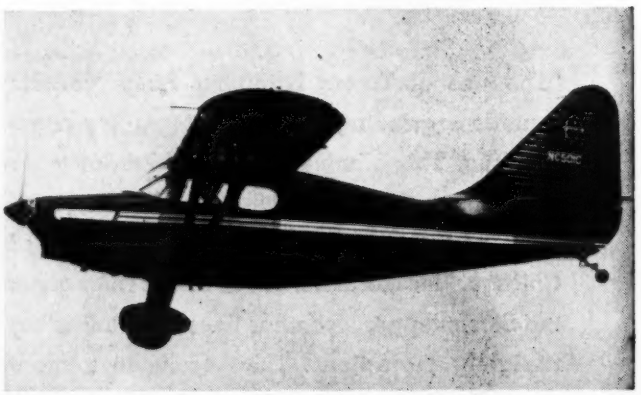


Piper Clipper

Beechcraft Bonanza Model 35

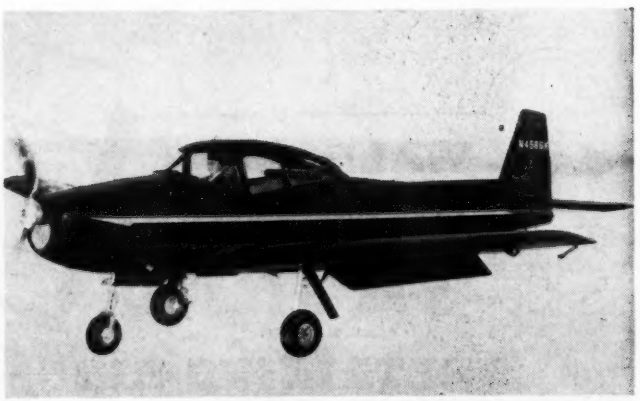


Bellanca Cruisair



Piper Stinson

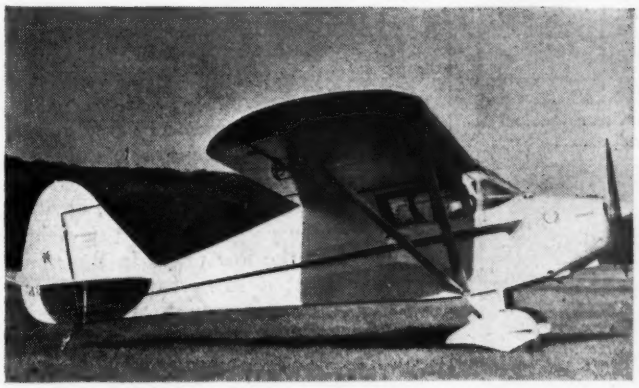
Johnson Bullet 185



Ryan Navion

Cessna 140

TEMCO Swift 125



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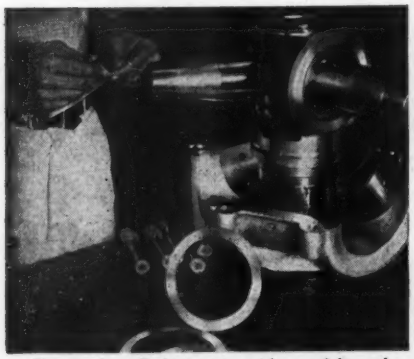

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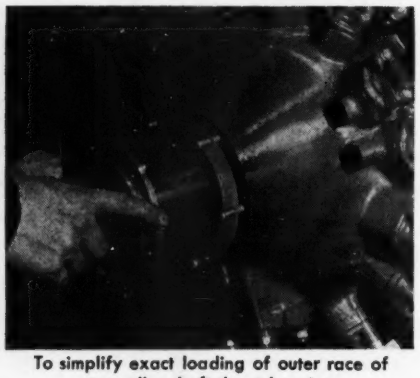

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* LAMINUM (Reg. U. S. Pat. Off.) shims are solidly bonded laminations of .002 or .003 inch precision gauge brass or steel with a microscopic layer of metallic binder. Cut to your exact specifications.

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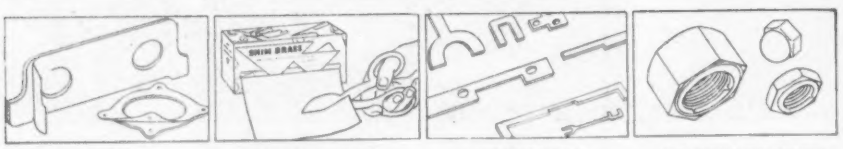
LAMINATED SHIM COMPANY, Inc.

5102 Union Street Glenbrook, Conn.



SHIMS SHIM STOCK STAMPINGS AN-COR-LOX NUTS

percentage allocating a larger percentage for business flying.

▶ **Used Planes**—Until disparity between new plane prices and used plane prices is lessened, it seems likely that a large part of the total volume of all plane purchases will continue to be in the used plane market. Doubtless, many such transactions will involve purchase of nearly new executive type aircraft by business flyers from owners who had bought them for pleasure flying or some other reason and who did not get the sufficiently high amount of utilization from their planes to make their continued ownership economical.

▶ **Used Prices**—Currently, postwar 1947 two-placers of relatively good performance, equipped with sufficient instrumentation and gas capacity for cross-country business use, are advertised for approximately half new list prices—ranging for different types from $1500 to $2500. Used four-placers are apparently in greater demand, so the margin between new and used prices is not quite so great, but there are still obvious bargains being advertised in this field.

Effect of the low prices in the used-plane market is likely to be beneficial in the long-range growth of civil flying in two ways, although it is certainly causing the airplane manufacturers plenty of headaches at the moment.

- Low used plane prices will make aircraft users in a somewhat lower income group which does not have the initial investment available for a new plane, and yet which can use the planes to good advantage in business.
- A more realistic pricing of new planes by the manufacturers which will come closer to meeting the fierce competition of the used plane market, will open up a larger market for new planes.

(Piper's new four-place 115 hp. Clipper for $2995, the Piper two-place 65 hp. Vagabond at $1995 and the Luscombe two-place 65 hp. SkyPal at $2095 typify this pricing trend.)

Resort Airports

Interesting sidelight in the airport picture is the listing compiled by Aircraft Owners & Pilots Assn. of 77 resort airports in the U. S. and Canada.

Of the 72 American resort airports in 34 states most are airstrips at or adjoining the resorts and privately operated. A few are municipal fields.

Natural trend of sportsmen and recreation seekers toward flying is thus being associated with the plane's ability to provide transportation for them to back country recreation areas, in some cases virtually inaccessible by surface travel. Development of additional resort landing facilities to stimulate additional flying sportsman business and accommodate existing business is expected.

Need Power in a Small Package?

put it up to EEMCo

Just as during the war, EEMCO has continued on into peacetime its concentration on serving the aircraft industry... performing a specialized design, development, engineering and manufacturing service. Leading aircraft builders have asked us to contribute to some of the most important aircraft of the last decade, and to many more now under development. EEMCO-built motors and actuators have solved the very toughest problems of function, power, size, weight, shape, performance, installation and operation. Let EEMCO tackle *your* problem.

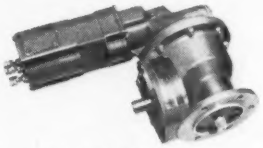
Actuators and Motors like these ...of difficult and unusual design... are our specialty

STABILIZER ACTUATOR, Linear Type
Motor inline with screw. Magnetic clutch. Radio noise suppressors. Travel limit switches. Weight, 14 lbs. Normal load, 2500 lbs. Rate of travel, half-inch per second.

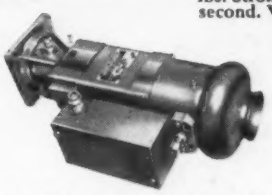
CANOPY ACTUATOR, Rotary Type
Inline rotary actuator equipped with clutch and brake. Radio noise filter. Designed to meet an exacting space requirement.

STABILIZER ACTUATOR, Linear Type
Magnetic clutch, radio noise suppressors. Normal load 2500 lbs. Maximum load, 8,000, static, 20,000 lbs. Stroke 7-1/2 in. Rate of travel, .62 inches per second. Weight, 17 lbs. Non-jamming end stops.

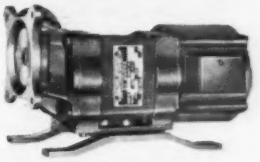
STANDBY MOTOR FOR WING FLAP ACTUATOR
Equipped with radio noise filter, magnetic clutch and brake. Brake torque, 30 inch-pounds.



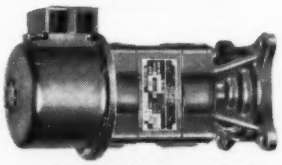
VARI-CAM ROTARY ACTUATOR
Magnetic clutch and brake. Overload torque limiter. Provision for manual operation.



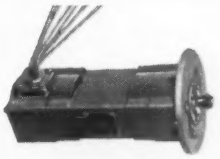
HYDRAULIC PUMP DRIVE MOTOR
Open through ventilated for continuous duty. 3-3/4 H. P. continuous. Equipped with radio noise filter and integral gear reduction . . . Weight, 23-3/4 lbs.



EXPLOSION PROOF AILERON BOOSTER MOTOR
Explosion proof, continuous duty. 1-1/2 H. P. continuous duty rating. Peak intermittent duty rating, 2.7 H.P.

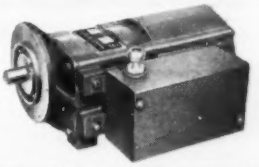


AILERON BOOSTER MOTOR
Open through ventilated for continuous duty operation. Integral gear reduction. Weight, 12 lbs. 2 H. P. continuous rating.



2-SPEED AZIMUTH MOTOR FOR RADAR SCANNER
Two-speed reversible. 3,000 R.P.M., 12,000 R. P. M. Double winding to give close speed regulation at both speeds.

PILOT SEAT ACTUATOR MOTOR AND CLUTCH
30 second duty cycle, 1/2 minute out of 10 minutes at 95 watts output. Weight, 18 oz. Specifications can be varied to suit special conditions.



WATER INJECTOR PUMP MOTOR
4.15 H. P. Duty cycle, 3 minutes full load, 3 minutes no load. Explosion-proof. Equipped with radio noise filter and integral gear reduction.

TELL US YOUR REQUIREMENTS
Check with us on a current motor or actuator design problem.
Give us the following preliminary data:
Type of unit • Specific function • Special requirements • Operating conditions • Motor and actuator specifications
Any available drawings, diagrams, and tables should be provided.

ELECTRICAL ENGINEERING and MFG. Corp.

EEMCo

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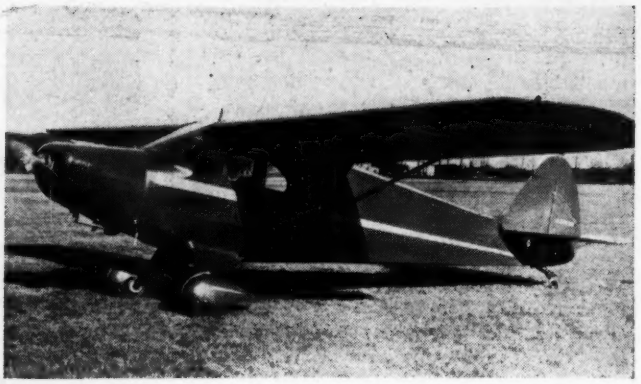
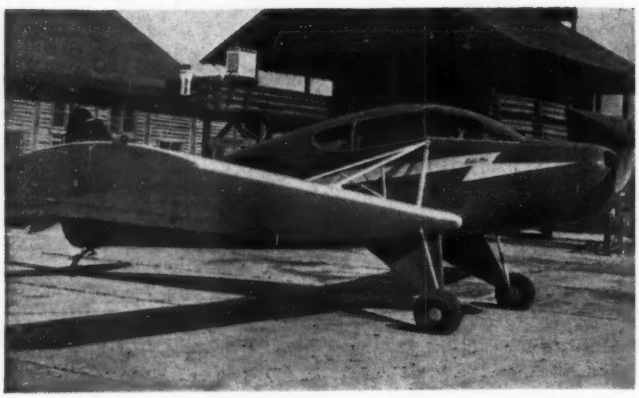
Cessna 195



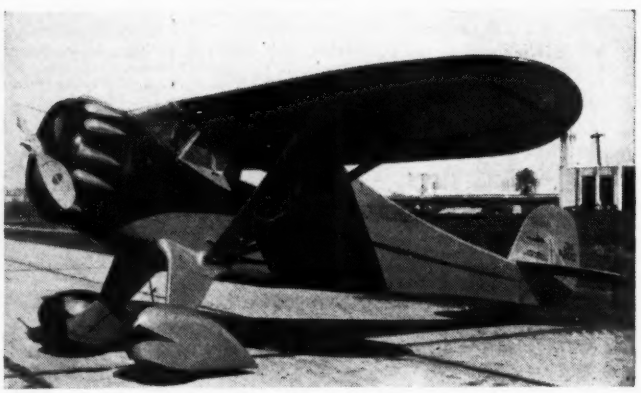
Piper PA-14

Funk F2B

Aeronca Sedan



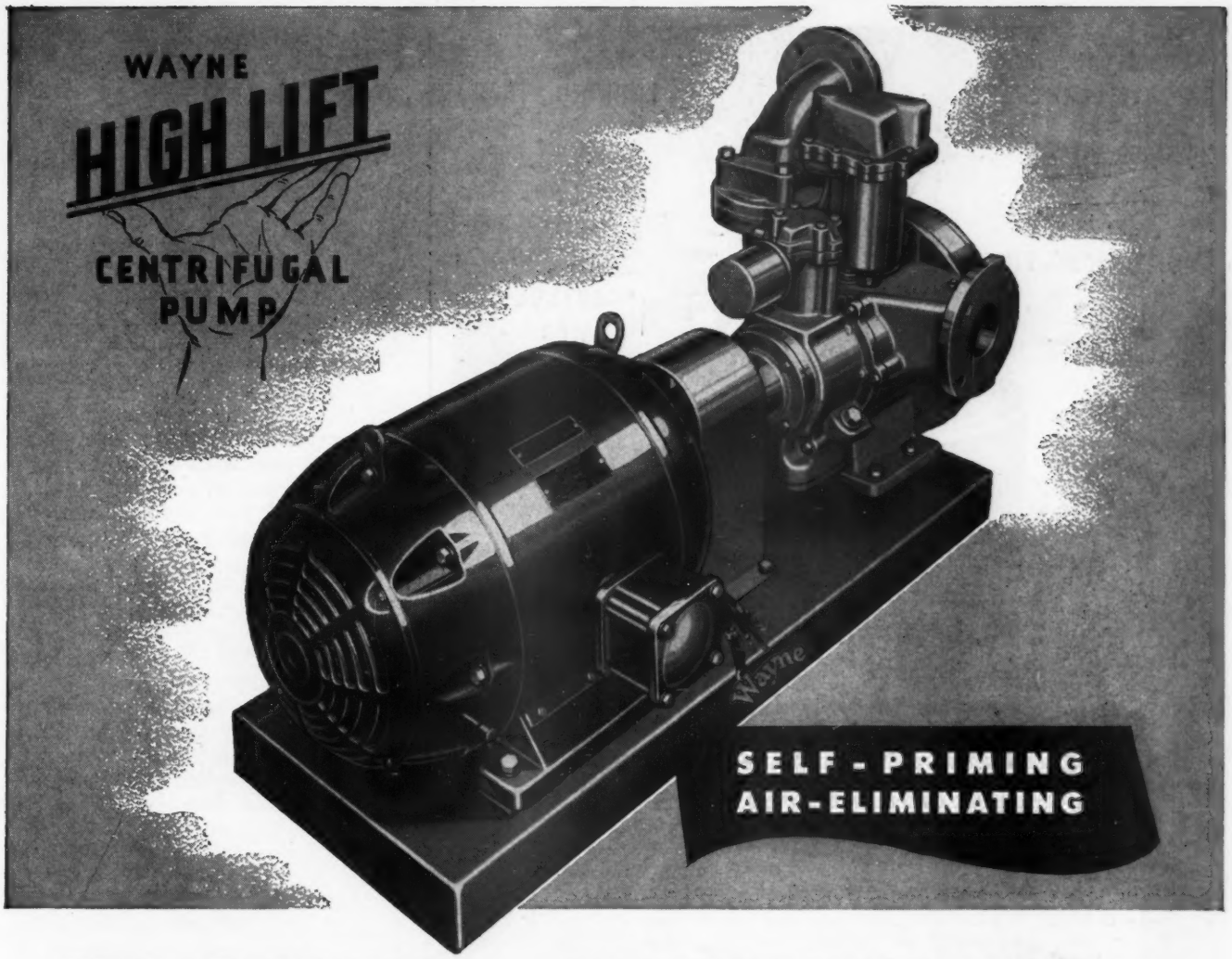
Callair A-3



Monocoupe 110 Special

Taylorcraft Traveler

Aero-Flight Streak 165



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IN HANDLING PETROLEUM PRODUCTS

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1. *Positively Self-Priming*
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3. *Quiet Centrifugal Operation*
4. *No By-pass Valve is Needed*
5. *Running Dry Does Not Harm This Pump*
6. *Rugged and Weather-proof Housing*

HERE IS a centrifugal pump especially developed for the petroleum industry that is really three units in one. It incorporates a vacuum priming pump, an air eliminator and a centrifugal pump in one efficient, compact unit. Pump can be completely disassembled for service without disconnecting piping. Ideal for bulk plant, truck and general terminal service.

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—there's a SHERWIN-WILLIAMS FINISH *of the Highest Quality!*

Whatever your requirements in aircraft finishes, you can get *one* quality—from *one* source—Sherwin-Williams!

For your convenience, there are *19 carefully selected colors* —plus black and white—in the complete Sherwin-Williams Aircraft Color Line. These colors have been chosen for their purity, richness, cleanness, brilliance and outstanding *durability.* Pigments are pure struck colors, free from any tinting (except where hue is lightened by addition of white). And all of these colors are available in four types of finish: Opex Pigmented Nitrate Dope, Opex Pigmented Butyrate Dope, Opex High Gloss Lacquer, Kem Synthetic High Gloss Enamel.

In addition to this comprehensive color line, Sherwin-Williams offers selected finishes for every aircraft and airport need from ramp equipment to offices and hangars. The Sherwin-Williams Co., Aircraft Division, Cleveland 1, Ohio. (Export Division, Newark, New Jersey.)

Products of SHERWIN-WILLIAMS Industrial Research

SHERWIN-WILLIAMS
AIRCRAFT FINISHES

Safety

Progress is made, but accidents resulting from stalls show increase.

Slow but perceptible progress toward greater safety in non-air carrier flying is shown in the CAB analysis of accidents in the record flying year of 1947, when 16,137,000 hr. were flown, an increase of 67 percent over the largest previous total of 9,653,180 hr., in 1946.

During 1947 (last year for which complete figures are now available) there were 9253 non-carrier aircraft accidents in which persons were injured or killed, including 882 fatal accidents and 607 accidents in which serious injuries were suffered.

On a basis of hours flown, the accident rate was reduced appreciably in 1947 from 1946, dropping from 7.8 accidents per 10,000 hr. to 5.7 accidents in the same number of hours.

Reckless flying in disregard of safety regulations as usual accounted for a large proportion of the fatal accidents (40 percent), but this percentage was slightly reduced from 1946 when 47 percent of the fatal accidents involved CAB violations.

Despite postwar trends toward spin-resistant aircraft and the development of effective stall warning indicators, the record of stall accidents increased in 1947 with 433 fatal accidents (49.1 percent of all fatal accidents) and 249 serious injury accidents (41 percent of all serious injury accidents) reported from this cause.

Safety violations again were a serious factor in the stall accident totals. Of the fatal stall accidents 140 (32.3 percent) took place during reckless flying and 11 fatal stalls abruptly terminated acrobatic flights without parachutes.

Instructional flying showed continued improvement in safety. In 10,353,000 hr. of this type of flying there were only 252 fatal accidents in 1947 or a rate of 0.2 fatal accidents per 10,000 hr. The 1946 rate was 0.3/10,000 for instructional flying.

Non-commercial flying accounted for 51.8 percent of all accidents, 60 percent of fatal accidents and 28.6 percent of the hours (4,618,000). Amount of non-commercial flying nearly doubled over the previous year's total, and the rate of fatal accidents in this type of flying dropped in 1947 to 1.1 in 10,000 hrs. as compared to 1.4/10,000 in 1946.

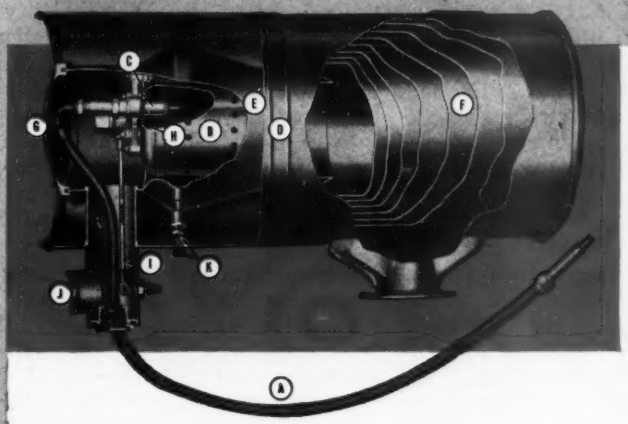
Commercial and miscellaneous flying was the only type to show a slight drop in hours flown from 1946, attributable probably to the high utilization of available experienced pilots and aircraft for instruction in GI flight schools. Com-

MINIMUM MAINTENANCE + MAXIMUM SAFETY
Put This Heater in the Nation's Leading Aircraft

South Wind's "921" Aircraft Heater with 200,000 BTU capacity is selected for Boeing, Grumman, Lockheed, Martin and North American aircraft. Easy installation and minimum maintenance are allowed by the sturdy, simplified construction of this "sealed flame" heater. The entire burner, including fuel nozzle and spark plug, can be removed and serviced in *minutes!* The ventilated spark plug prevents fouling and insures automatic gap maintenance.

Completely separate combustion and ventilation systems with individual air ducts increase the safety of this compact, lightweight unit. The hermetically "sealed flame" operates in a jet-engine type burner. Requires no air or fuel regulation even under widely varying flight conditions. Low stack and metal temperatures at full capacity operation result in highly efficient operation for the "921" in both cabin heating and thermal anti-icing applications.

South Wind's "921" is the only 200,000 BTU capacity aircraft heater which meets the rigid CAA life and safety requirements for thermal anti-icing. The "921" also bears Yellow Dot Approval of the U. S. Army Air Forces for winterization operation. High explosion resistance under severest testing conditions proves the greater safety and efficiency of South Wind "sealed flame" design. Here, in detail, is why leading manufacturers specify South Wind . . .



A. IGNITION CABLE—Hermetically sealed and shielded to prevent radio interference.

B. BURNER—Jet-engine type burner will operate over complete range of flight conditions without need for elaborate air or fuel controls.

C. VENTILATED SPARK PLUG—Dual-electrode type with ground electrode attached to spark plug housing.

D. HEATER CASE—Rugged, but lightweight stainless steel, for utmost in safety and serviceability—beaded at both ends for quick easy attachment of ducting.

E. BURNER HOUSING—All-welded—high quality stainless steel—completely separating the combustion system from the ventilating air system.

F. HEAT EXCHANGER—Hermetically sealed, all-welded, stainless steel heat exchanger incorporating multiple surfaces and famous South Wind "accelerating flow" to maintain uniform, high heat transfer efficiency.

G. BURNER HOUSING COVER—Pressure tight but easily removable for quick servicing of burner, nozzle and spark plug assembly.

H. FUEL NOZZLE—Pressure type spray nozzle, meters and atomizes gasoline for peak combustion efficiency—air curtain shields nozzle from combustion products to eliminate nozzle deposits.

I. FUEL LINE—Integral all-welded fuel line and nozzle holder assembly—no fittings to loosen or leak—entire assembly enclosed in combustion system—doubly separated from ventilating air stream.

J. COMBUSTION AIR INTAKE—Separate combustion air intake completely isolated from ventilating air stream.

K. FUEL DRAINS—New sump-type drain assures complete, safe removal of excess fuel.

Adaptable to any type Aircraft,

South Wind heaters are designed simply, to solve heating problems in commercial, military and civilian aircraft. South Wind production facilities can now satisfy all delivery requirements on heaters from 25,000 to 700,000 BTU capacities. Write today for specific model information or expert assistance on your aircraft heating problem. South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.

South Wind

AIRCRAFT HEATING AND THERMAL ANTI-ICING EQUIPMENT

Another Product of STEWART WARNER

mercial and miscellaneous flying also showed improved safety with 0.8 fatal accidents in 10,000 hr. as compared to 1.1/10,000 in 1946.

Accidents were classified as follows: landing, takeoff and taxiing, 3760; collision with objects other than aircraft (wires, trees, buildings, etc.) 3326; stalls, 1314; materiel failures in flight and on ground, 1228; collision between aircraft, 281; propeller accidents to people, 50; fire, on the ground 17, in flight, 21; miscellaneous, 49, and undetermined, 17.

Primary accident causes were listed as: pilot error, 6169; materiel failure, 1228; weather, 884; terrain, 666; other personnel, 215; miscellaneous, 57; and undetermined, 34.

CAB analysts point out that planes being dived or flown low over people, buildings or congested areas or being stunted at low altitudes resulted in 518 accidents or only 5.6 percent of the total, but that this small group of "buzz-boy" pilot accidents accounted for 26 percent of all fatal accidents, and practically one-fourth of the total of 1352 persons who lost their lives.

Industrial Use of Aircraft Growing

So valuable are small planes in spraying and dusting that two manufacturers are building special models.

Expansion of the use of aircraft in the U. S. as industrial tools, which was unmistakable in 1948, promises to continue at possibly an even faster rate in 1949.

Most rapid has been the growth of aircraft use in spraying and dusting for pest and weed control and to a lesser extent for seeding and fertilizing of areas which cannot be profitably handled by surface means.

▶**Uses**—Some other uses in which aircraft served primarily as a special purpose tool because of the aerial vantage point which it offers:

Aerial photography, mapping, surveying, patrols of powerlines, pipelines and fences; sky writing, forest fire fighting, radar oil search, mineral prospecting, hunting, rainmaking, stocking lakes and streams with fish, checking crops and livestock, and blimp electric sign advertising.

At peak of the 1948 summer season CAA was granting one-year waivers for low flying to spraying, dusting and seeding operators at the rate of 400 a month.

It is estimated that probably half of the 10 million lb. of the new weed-killing 2,4-D chemical used in 1948 was applied to the nation's farm fields by aircraft.

More than 100 towns, communities and resort areas contracted in 1948 for air spraying with DDT insecticides to control flies and other insect pests in their areas.

▶**Operator Increase**—In June 1948, CAA records indicated there were 501 dusting operators and 494 spraying operators (many of them duplicated) as compared to 188 dusting operators and 12 spraying operators in May of 1946.

Typical of weed control projects is the destruction of sagebrush and other shrubs by 2,4-D aerial spraying, on southwestern stock ranges, as described in a recent U. S. Dept. of Agriculture report. More than 100,000 acres of sagebrush range were treated in 1948 by airplane, at a total cost of $2 an acre, excluding the hire of the flagmen who direct the spraying planes.

Proper application of one pound of the chemical per acre in solution of approximately five gallons of oil and water emulsion is sufficient to eradicate 80 percent of the sage brush plants and control the remainder, with some weak regrowth dying the following summer. Grazing results from sprayed pasture are considered equivalent or superior to those obtained from mowed pasture and the aerial spraying is quicker, cheaper and easier than the mowing process.

▶**Enormous Potential** — Potential of widespread weed control through aerial spraying and dusting, in the additional agricultural productivity per acre to be obtained is enormous. It has been estimated that the entire cost of the Marshall plan for one year could be saved by the extra food production in this country which would result from a national weed control effort.

At least two personal plane manufacturers, Piper and Luscombe, have announced development of factory-built 90 hp. 1949 model sprayer planes designed especially for this work, another factor which may stimulate the further growth of industrial flying. Heretofore most aircraft used have been higher-powered biplanes, in many cases converted from surplus primary trainer models.

Use of the helicopter in the fields of spraying, dusting and seeding has developed within the last two years, with Bell Aircraft taking the leadership in this field by manufacturing a special agricultural model of the two-place Model 247 helicopter. The downdraft from the rotor blades and the ability of the hovering helicopter to work at slow speeds in areas which the most daring fixed-wing operator might hesitate to attempt, make the rotary-wing aircraft probably the most efficient means yet devised for this work.

However the higher operating cost of the helicopter, reflected usually in a somewhat higher cost per acre for its services, has held back its progress. In 1947, more than 30 helicopters were used in this work, and this number was increased considerably in 1948.

▶**Bulletin**—A CAA bulletin "Industrial Flying" (July 1948) asserts that any pilot planning to engage in dusting, spraying, seeding etc. needs: "services of an engineer to design the proper apparatus, a chemist, an entomologist and a plant pathologist to determine cause and cure of the problem, and a botanist and the plant pathologist to know what formulas will be effective in individual cases. The farmer owner of the crop must also be completely informed of advantages and limitations."

This leads to consideration of the problem of the farmer who owns an airplane and wishes to use it himself for such purposes. Current CAA requirements for waivers for low flying for pest control require that the applicant is using a capable and experienced pilot holding at least a commercial rating. Some state aeronautics commissions are prescribing similar requirements.

▶**Hazards**—Hazards involved in low-level flying for dusting, spraying and seeding are not to be regarded lightly. CAB records showed 164 crop-dusting accidents in 1947 including 24 fatal accidents and 16 serious injury accidents. Yet there are many proficient farm flyers without commercial licenses who would be qualified for this type of flying on their own farms, and provision for them to do this flying without unnecessary regulatory hindrance will be needed if full potential of farm flying growth is to be realized.

Legal problems created by damage to neighboring crops from drifting aerial sprays and dusts, are being studied by CAA, state aeronautical bodies, the National Flying Farmers Assn., the Department of Agriculture, state agricultural colleges, and other groups. It is anticipated that legislative restriction may be forthcoming from a number of the state legislatures meeting this year on this subject. Efforts are being made individually and collectively by the state and federal agencies and the flying farmers to develop more standardized techniques and to disseminate more widely necessary information for most efficient use of aircraft in agriculture.

The Martin AM-1 Mauler Attack Plane, dubbed "Able Mabel" by men of the fleet

ROUGH, TOUGH . . . *and* TERRIFIC!

NO better words describe the tremendously powerful Martin AM-1 Mauler . . . carrying more than *9,000 lbs. of destruction* in this startling flight photograph! Three full-size torpedoes, 12 rockets and four 20 mm. aerial cannon make up its payload. The Mauler's all-up weight as photographed is 25,520 lbs.—well in excess of ordinary twin-engine airliners. Yet the almost unbelievable payload pictured is *considerably less* than the maximum possible for the single-engine, one-man airplane—with maximum take-off weight over 29,000 pounds and top payload close to 6 tons!

Fresh from successful carrier tests aboard the U.S.S. Kearsage, these mighty Maulers are the Navy's largest, fastest, most heavily armed carrier-based, dive-torpedo bombers. Powered by a 3000-horsepower Pratt & Whitney Wasp Major engine, most powerful conventional engine in service today, they have the range to carry out their assigned missions. More than 100 hard-hitting Maulers have been delivered to the Navy.

The Mauler takes its place in a long line of great planes Martin has been building for our armed services since 1913. Planes that rank high in Martin's 40-year history of building *air power* to serve the nation, *air transport* to serve its people!

The Glenn L. Martin Company, Baltimore 3, Md.

Martin
AIRCRAFT

Builders of Dependable Aircraft Since 1909

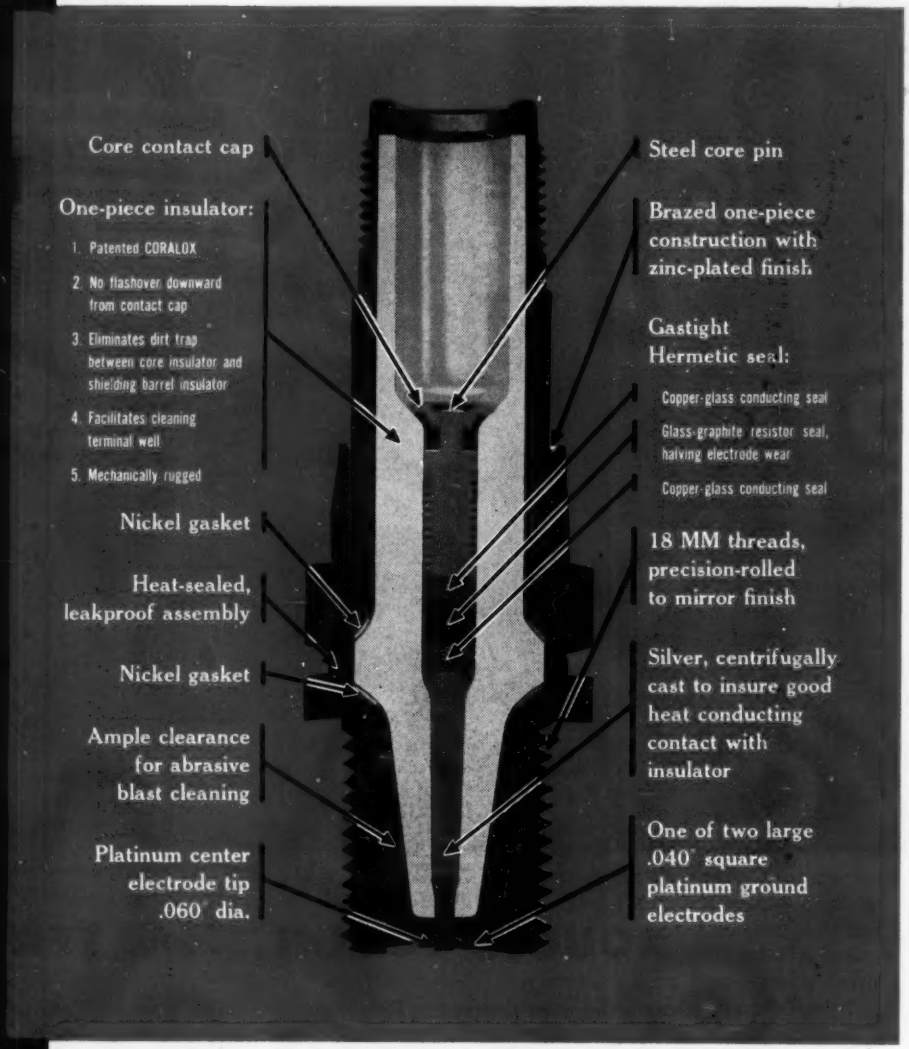
Check the sectional illustration of the AC-181 Spark Plug and the descriptive captions around it—with your performance requirements in mind.

These AC features, combined, produce a plug which has proved to be exceptionally resistant to lead fouling, in service tests and engine builders' tests alike. Furthermore, AC-181 habitually reduces off-schedule plug changes. And it is Pratt & Whitney and C.A.A. approved for R-1690, R-1830, R-2000, R-2800, and R-4360 power.

A COMBINATION OF

"Performance" Features

NOT FOUND IN ANY OTHER SPARK PLUG


Core contact cap
One-piece insulator:
1. Patented CORALOX
2. No flashover downward from contact cap
3. Eliminates dirt trap between core insulator and shielding barrel insulator
4. Facilitates cleaning terminal well
5. Mechanically rugged
Nickel gasket
Heat-sealed, leakproof assembly
Nickel gasket
Ample clearance for abrasive blast cleaning
Platinum center electrode tip .060" dia.
Steel core pin
Brazed one-piece construction with zinc-plated finish
Gastight Hermetic seal:
Copper-glass conducting seal
Glass-graphite resistor seal, halving electrode wear
Copper-glass conducting seal
18 MM threads, precision-rolled to mirror finish
Silver, centrifugally cast to insure good heat conducting contact with insulator
One of two large .040" square platinum ground electrodes

AC

AIRCRAFT SPARK PLUGS

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AC makes many aircraft products, all to AC's highest quality standards:

TACHOMETERS • TEMPERATURE GAUGES • AMMETERS
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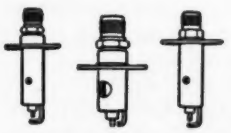


AC Plugs for jet engines have also participated in the establishment of many speed records.

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION • FLINT 3, MICHIGAN

Airports: Base and Basis Of Air Power

There still aren't enough landing fields to provide well-rounded system.

U. S. airport system reached a new high point of 6414 fields at the beginning of 1949 with addition of 655 airports since Jan. 1, 1948, a gain of approximately 10 percent.

While landing facilities are expanding faster proportionately than the number of airplanes to use them, the number is still inadequate to provide the nation with a well-rounded airport system. In comparison to airport growth, total number of U. S. civil aircraft Jan. 1, 1949 was 95,997 as compared to 94,821 a year ago.

▶ **Tabulation**—Breakdown of airport types reveals there were 2050 municipal airports, a gain of more than 200; commercial airports had climbed to 2989 from last year's 2849; military and CAA intermediate airports showed smaller totals as some of these fields were taken over for civilian uses and others were abandoned; (military airports totalled 398 against 501 last year, and CAA intermediate fields totalled 161 against 178 a year ago) and private and miscellaneous government airports expanded from 413 to 816, a large part of the total gain.

Analysis of airports by classes as of Jan. 1, 1949, shows the following status; Class I and sub-I fields, 4006; Class II, 972; Class III, 471; Class IV, 361; Class V, 131, and Class VI and over, 75.

In comparison with earlier years of the federal airport program, progress made by CAA in 1948 was rapid. Since 1946, the beginning of the program, 594 grant offers have been made for a total outlay of $62,092,244 in federal funds. Only 132 of these grants for $13,702,276 had been made prior to Jan. 1, 1948.

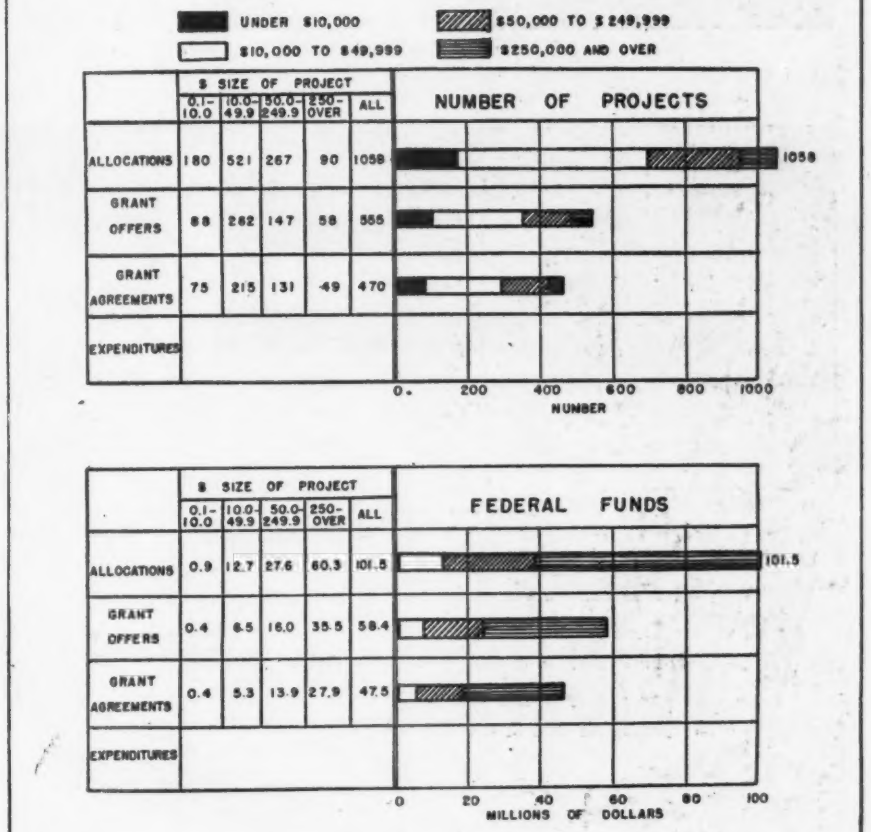
Most of the 462 grant offers made in 1948 involving $48,702,276, were for larger airports. The division: 87 for Class I fields, 123 for Class II, 114 for Class III, and 138 for Class IV or larger. Included in grants were 149 projects totalling $9,769,946 for construction of new airports.

CAA estimated that approximately 150 of the airport aid projects were completed as of Jan. 1.

▶ **Fallen Short**—Federal appropriations for airport aid have consistently fallen short of the amount indicated in the original federal airport act of May 1946. The act authorized a seven-year program with federal contributions up to $500 million not more than $100 mil-

STATUS OF FEDERAL AID AIRPORT PROGRAM

OCTOBER 31, 1948

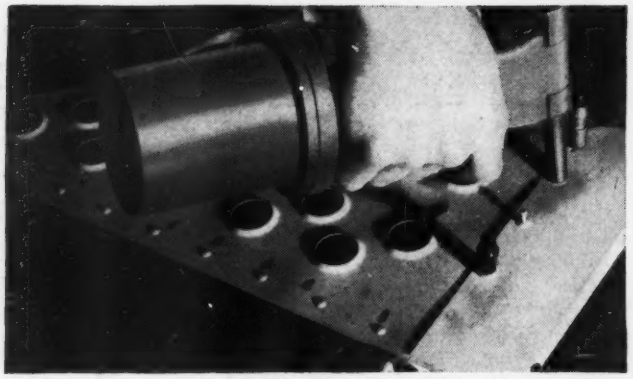


Source—CAA

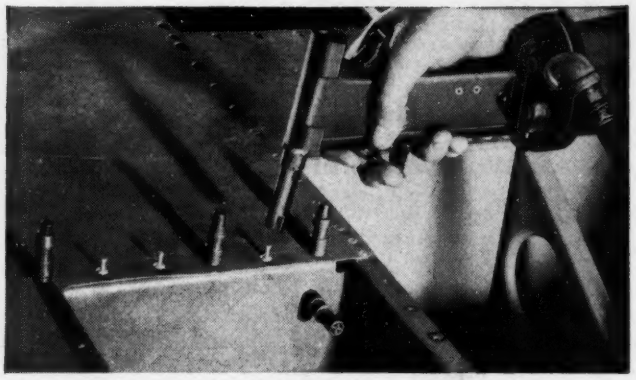
Maximum and Minimum Standards for Runways Constructed With Federal Funds

Air Carrier Service	Runway Length Feet	Width	Taxiway Length Feet	Landing Strip Width Feet	Pavement Loading per Wheel in Lb. Single Wheel	Dual Wheel
Feeder.....	3500	100	40	300	15,000	20,000
Local.....	4200	150	50	400	30,000	40,000
Express.....	5000	150	60	500	45,000	60,000
DeLuxe.....	5900	150	75	500	60,000	80,000
International ..	7000	200	75	500	75,000	100,000
Intl Express ..	8400	200	100	500	100,000	125,000

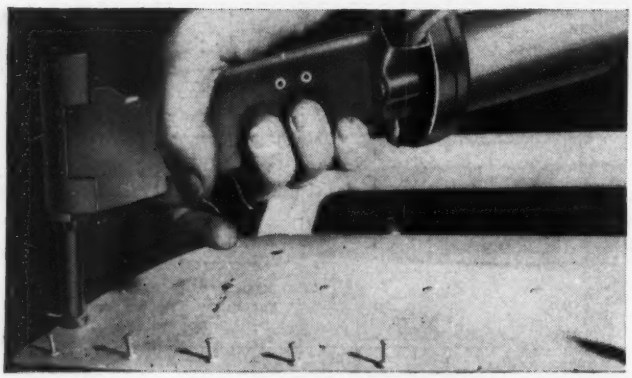
Definitions: Feeder—Airports to serve certificated feeder airlines.
Local—Airports to serve smaller cities on airline trunk routes.
Express—Airports at important cities or junction points on trunk routes.
DeLuxe—Airports serving aircraft making long nonstop domestic flights.
International—Airports terminating long international flights.
Intl. Express—Airports serving the highest type of transoceanic flights.



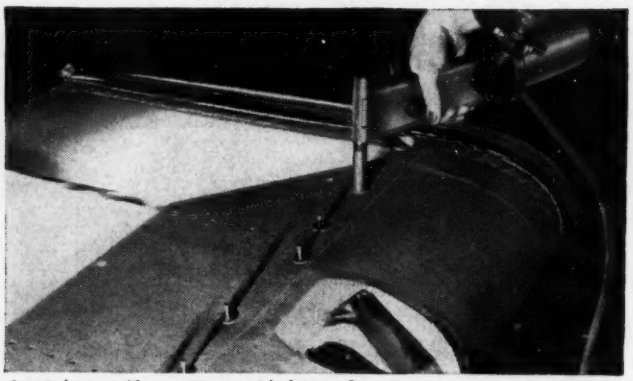
Sub-assembly being fastened to a tubular member with Cherry Blind Rivets at the Boeing Airplane Company, Seattle, Washington.



Cherry Self-plugging Blind Rivets securely fasten panels on B-50 bomb-bay doors.



Boeing fabricated chairs are assembled with Cherry Self-plugging Blind Rivets.



Special type Cherry Rivets with large, flat, thin heads are used to fasten cloth to ailerons.

CHERRY BLIND RIVETS ..... make the hard jobs easy

PRODUCTION IS SMOOTHER. Cherry Blind Rivets free production planning for difficult-to-reach blind spots in all types of assembly work. Fuselage, wing, tail group, and other aircraft assemblies are finished much faster with Cherry Rivets. Only one man is needed . . . There's no bucking with Cherry Rivets. Cherry Blind Riveting gives you a quicker fastening method fully adapted to production-line assembly work.

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COMPARABLE TO SOLID RIVETS. Cherry Self-plugging Rivets have shear values comparable to solid rivets. Excellent hole-filling qualities insure vibration-resistant joints. Cherry Rivets combine simplicity with strength . . . the simplicity of their fastening technique makes them a "standard" on aviation production lines. Try Cherry Rivets today and gain years of less-expensive, more efficient production assembly.

Cherry Rivets are made from aluminum alloy, steel, or Monel. Standard rivets come in five diameters and two head styles. There is a wide range of grip lengths. Special heads, diameters, grip lengths, and alloys can be made to order. WRITE US TODAY FOR FURTHER INFORMATION. BOOKLET MAILED ON REQUEST. ADDRESS DEPT. B-110, CHERRY RIVET COMPANY, 231 WINSTON STREET, LOS ANGELES 13, CALIFORNIA.

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Cherry Rivet Company
LOS ANGELES 13, CALIFORNIA

CHERRY RIVETS ARE APPROVED BY CIVIL AERONAUTICS AUTHORITY AND UNDERWRITERS' LABORATORIES, INC.

lion to be provided in any one year. Actually funds thus far appropriated total $117,500,000, divided into yearly allotments of $45 million, $32.5 million and $40 million.

If Congress were to make appropriations large enough to use the full remaining amount of authorization up to $500 million, the appropriations this year and in the remaining three years would need to be approximately double the allotments which have been voted thus far. There is no indication that the 81st Congress wants to raise the ante for airports this year and nobody seems to be making a very determined

Classes of Airports by States

Jan. 1, 1949

(Data covers existing airports recorded with the CAA)

STATE	TOTAL	CLASS					
		[1] Sub I and I	II	III	IV	V	VI & Over
Total	**6,414**	**4,065**	**1,009**	**561**	**448**	**187**	**144**
Alabama	97	51	17	14	13	0	2
Arizona	187	76	44	38	14	12	3
Arkansas	91	55	13	15	8	0	0
California	463	259	69	41	36	35	23
Colorado	101	54	24	13	1	4	5
Connecticut	33	24	1	3	4	1	0
Delaware	20	13	4	0	1	0	2
Dist. of Columbia	3	0	0	0	1	1	1
Florida	208	58	32	44	48	11	15
Georgia	141	59	28	24	23	4	3
Idaho	109	84	11	9	2	0	3
Illinois	177	126	36	4	7	4	0
Indiana	169	115	34	9	9	2	0
Iowa	183	150	23	2	7	0	1
Kansas	202	141	22	16	5	10	8
Kentucky	67	56	2	4	4	0	1
Louisiana	95	54	17	10	9	2	3
Maine	73	49	6	12	2	2	2
Maryland	52	24	15	3	8	0	2
Massachusetts	80	57	4	9	7	0	3
Michigan	235	171	38	10	13	2	1
Minnesota	123	81	30	6	4	1	1
Mississippi	94	57	15	13	7	0	2
Missouri	119	75	24	11	5	3	1
Montana	101	64	18	8	5	2	4
Nebraska	137	103	18	0	4	2	10
Nevada	59	21	5	14	9	9	1
New Hampshire	32	21	5	3	2	0	1
New Jersey	93	63	17	7	4	0	2
New Mexico	111	68	14	6	9	8	6
New York	276	215	30	12	13	4	2
North Carolina	151	103	14	16	12	2	4
North Dakota	91	67	15	3	6	0	0
Ohio	251	190	41	9	7	2	2
Oklahoma	165	105	24	14	13	6	3
Oregon	115	75	9	12	14	4	1
Pennsylvania	225	171	33	13	8	0	0
Rhode Island	11	7	0	2	0	2	0
South Carolina	67	30	13	5	10	6	3
South Dakota	68	51	6	3	4	2	2
Tennessee	78	40	24	7	6	1	0
Texas	624	371	113	61	43	27	9
Utah	59	24	11	15	4	4	1
Vermont	23	19	0	4	0	0	0
Virginia	127	88	14	10	11	2	2
Washington	164	102	23	10	17	5	7
West Viriginia	52	36	10	2	3	1	0
Wisconsin	157	115	28	9	3	1	0
Wyoming	55	27	15	6	3	3	1

[1] *Sub I airports are those which exist but do not come up to Class I standards.*

Classification of Airports:

Class I airports are for private owners of smaller type aircraft; Class II, private owners of largest type aircraft and feeder transport aircraft; Class III, present day transport aircraft; Classes IV and over, largest aircraft now in use and those planned for immediate future.

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"Kwik-Klamp" Toggle Clamps speed handling of light work, eliminate T-bolts and clamps, C-clamps, screws and jacks. Versatile types and sizes with holding pressures from 300 to 750 lbs.

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U. S. Personal and Executive Aircraft

Manufacturer	Designation	Number of places	Powerplant						Performance								Weights		Dimensions			Standard Equipment							
			Number and make of engines	Normal rated hp.	At r.p.m.	At altitude (ft.)	Make of propeller	Diameter, in.	High speed, mph.	At altitude (ft.)	Cruising speed, mph.	At altitude (ft.)	Takeoff distance[1] (ft.)	S. L. rate of climb, first min. (fpm.)	Normal range, mi.	Absolute ceiling (ft.)	Gross weight, lb.	Empty weight, lb.	Span	Length	Height	Make of instruments	Radio	Position lights	Landing lights	Starter	Price, F.A.F.	Number of sales, 1948
Aero Design and Engineering Corp. Culver City Airport, Culver City, Calif.	Aero Commander	5	2 Lycoming	190	2550	S.L.	Aer	82	190	1000	175	1000	1080	1200	850	24,000	4600	2800	44′	33′	12′	NA	GE	Gr	Gr	Del	$25,000+	*
Aero-Flight Aircraft Corp.	Streak-85	2	Continental	85	2575	S.L.	Sen	68	175	S.L.	165	S.L.	975	950	750	18,500	1400	850	25′ 3″	21′ 2″	8′ 3″	NA	Ha	Gr	GE	Del	.....	*
Long Beach Mun. Airport,	Streak-125	2	Continental	125	2550	S.L.	Sen	70	202	S.L.	192	S.L.	850	1500	850	22,500	1560	955	25′ 3″	22′ 4″	8′ 3″	NA	Ha	Gr	GE	Del	.....	*
Long Beach, Calif.	Streak-165	2	Franklin	165	2800	S.L.	Sen	73	219	S.L.	210	S.L.	900	2000	1060	26,500	1695	1045	25′ 3″	22′ 4″	8′ 3″	NA	Ha	Gr	GE	Del	.....	*
Aeronca Aircraft Corp.	Super Chief	2	Continental	85	2450	S.L.	Sen	72	100	S.L.	95	S.L.	550	600	400	.....	1350	820	36′	20′ 6″	4′ 7″	NA	.....	.....	.....	MD	$2585	89
Municipal Airport,	Champion	2	Continental	90	2350	S.L.	Sen	72	105	S.L.	95	S.L.	1150	870	295	.....	1300	809	35′	21′	5′ 6″	NA	.....	.....	.....	.....	$2495	.....
Middletown, Ohio	Sedan	4	Continental	145	2450	S.L.	Sen,Mc	76	120	S.L.	105	S.L.	1155	650	403	.....	2050	1150	37′ 6″	25′ 3″	7′	NA	Be	Gr	GE	Del	$4395	306
Anderson, Greenwood & Co. Sam Houston Airport, Houston, Texas	AG-14	2	Continental	90	2475	S.L.	NA	72	120	S.L.	110	S.L.	.....	600	400	19,000	1400	850	34′	22′ 6″	7′ 6″	Ko, Pi	GE	Gr	GE	Del	.....	*
Aquaflight, Inc Wilmington 278, Del.	Aqua I[3]	6	2 Lycoming	125	2600	S.L.	Sen	76	155	5000	125	3000	1100[2]	700	400	16,000	3600	2200	36′ 6″	29′ 6″	12′	NA	Le	Gr	Gr	Del	$18,000	*
Atlas Aircraft Co. Hemet, Calif.	H-10	4	Atlas	220	3000	S.L.	Atlas	96	170	S.L.	150	S.L.	.....	1200	1000	15,000[4]	3200	1992	33′ 9″	28′ 4″	8′ 2″	Atlas	.....	Atlas	.....	Atlas	$2995	*
Baumann Aircraft Corp. P. O. Box 3336, Glendale, Calif.	Brigadier		2 Continental	125	2550	S.L.	Sen	72	185	8000	165	8000	.....	1200	750	18,000[1]	3500	2150	41′	27′ 5″	10′ 4″	NA	SNR	SNR	SNR	SNR	$22,500	*
Beech Aircraft Corp. Wichita 1, Kan.	Bonanza	4	Continental	185	2300	S.L.	Bch	88	184	S.L.	170	8000	.....	890	750	17,100[4]	2650	1580	32′ 10″	25′ 2″	6′ 7″	Ko, Sh	SNR	Gr	GE	Del	$10,975	678
Bellanca Aircraft Corp. New Castle, Del.	Cruisair Sr.[4]	4	Franklin	150	2600	S.L.	Sen	74	170	....	150	....	.....	1100	700	22,500	2150	1255	34′ 2″	21′ 3″	6′ 2″	Ko, Pi	.....	SNR	GE	SNR	$6950	47
Cal Aero Tech. Institute Grand Central Airport, Glendale, Calif.	XLC-1	1	CAX-1000[6]	128	at cruise	.....	..		250	S.L.	200	S.L.	.....	1380	325	37,000	1278	588	20′ 10″	17′ 11″	5′ 11″	NA	.....	.....	.....	.....	$2500	*
Call Aircraft Co. Afton, Wyo.	A-3	2-3	Continental	125	....	....	Sen	48	120	....	105	....	.....	.....	.....	17,500	1550	975	35′ 9″	23′ 5″	7′	NA	HW	Gr	Gr	.....	$4525	NA
Cessna Aircraft Co.	120	2	Continental	85	....	S.L.	Sen	71	120+	S.L.	100+	S.L.	.....	680	450	15,500[4]	1450	785	32′ 10″	21′ 6″	6′ 3″	NA	.....	.....	.....	.....	$2845	150
Wichita 15, Kan.	140	2	Continental	90	....	S.L.	Sen	71	125+	S.L.	105+	S.L.	.....	690	450	15,600[4]	1450	860	32′ 10″	21′ 6″	6′ 3″	NA	.....	SNR	.....	SNR	$3345	623
	170	4	Continental	145	....	S.L.	Sen	76	140+	....	125	S.L.	.....	690	480	15,500[4]	2200	1185	36′	25′	6′ 7″	NA	.....	SNR	.....	SNR	$5995	553
	190	4-5	Continental	240	....	S.L.	Ham	93	170	7000	160	7000	.....	1050	750	16,000[4]	3350	2015	36′ 2″	27′ 2″	8′	NA	SNR	SNR	SNR	SNR	$13,250	43
	195	4-5	Jacobs	300	....	S.L.	Ham	93	180+	7000	165+	7000	.....	1200	750	18,300[4]	3350	2030	36′ 2″	27′ 4″	8′	NA	SNR	SNR	SNR	SNR	$14,950	144
Funk Aircraft Co. R. F. D. No. 5, Coffeyville, Kan.	F2B	2	Continental	85	2575	S.L.	Lw	72	115	S.L.	100	S.L.	.....	800	350	18,000	1350	890	25′	20′	6′ 1″	Ko	.....	Gr	.....	Del	$3895	6
Goodyear Aircraft Corp. Akron 15, Ohio	Ga-2	3	Franklin	145	2600	S.L.	NA	..	125	....	108	....	.....	600	310	14,000[4]	2200	1450	36′	26′	9′ 6″	NA	SNR	SNR	.....	Del	.....	*
Hall Aircraft Co. San Diego, Calif.	Flying Auto odel 118	4	Lycoming[5]	190	2550	S.L.	NA	78	133	S.L.	128	5000	675	645	400	13,500	2500	1500	34′ 6″	23′ 2″	8′ 3″	NA	SNR	SNR	SNR	SNR	.....	*
Johnson Aircraft Corp. Tyler, Tex.	Bullet 185	4	Continental	185	2300	S.L.	Har	78	.....	....	185	4000	1250	800	800	15,000	2300	1250	28′	23′ 2″	6′ 3″	NA	Be	Gr	GE	Del	$5000	*
Luscombe Aircraft Corp.	Silvaire 8A	2	Continental	85	2300	S.L.	Sen, Lw	71	115	S.L.	105	S.L.	.....	800	300+	15,500	1260	750	35′	20′	6′ 3″	Ai, Ko	.....	.....	.....	.....	$2095	215
P. O. Box 2128,	Silvaire 8F[6]	2	Continental	90	2475	S.L.	Lw	71	128	S.L.	115	S.L.	.....	850	550+	17,500	1400	810	35′	20′	6′ 3″	Ai, Ko	.....	.....	.....	.....	$2695	274
Dallas, Tex.	Observer T8F[6]	2[10]	Continental	90	2475	S.L.	Lw	71	125	S.L.	112	S.L.	.....	850	500+	17,500	1400	820	35′	20′	6′ 3″	Ko	.....	.....	.....	.....	$2795	NA
	Silvaire Sedan	4[10]	Continental	165	2050	S.L.	Har	80	140+	S.L.	130	S.L.	.....	900	500+	17,500	2280	1260	38′	23′ 6″	6′ 10″	Ai, Ko	.....	SNR	Lus.	Del	$7470	71

Manufacturer	Designation	Number of places	Powerplant						Performance								Weights		Dimensions			Standard Equipment					Price, F.A.F.	Number of sales, 1948
			Number and make of engines	Normal rated hp.	At r.p.m.	At altitude (ft.)	Make of propeller	Diameter, in.	High speed, mph.	At altitude (ft.)	Cruising speed, mph.	At altitude (ft.)	Takeoff distance[1] (ft.)	S. L. rate of climb, first min. (fpm.)	Normal range, mi.	Absolute ceiling (ft.)	Gross weight, lb.	Empty weight, lb.	Span	Length	Height	Make of instruments	Radio	Position lights	Landing lights	Starter		
Myers Aircraft Co. Box 721, Tecumseh, Mich.	Model 145	2	Continental	145	2700	S. L.	Har,Mc	74	165	....	150	S. L.	....	1000	500	20,000	1735	1120	30′	21′ 4″	6′	NA	.....	Gr	.....	Del	$5995	NA
Monocoupe Airplane & Engine Corp. Melbourne, Fla.	90AL–115	2	Lycoming	108	2800	S. L.	Mc	76	160	....	140	....	....	1000	500	18,000	1610	1000	32′	22′ 11″	6′ 11″	NA	.....	Gr	.....	Auto	$3890	NA
	110 Special	2	Warner	185	2175	S. L.	Aer	.....	200	S. L.	175	S. L.	....	3000	.....	20,000	1640	1040	23′ 3″	20′ 5″	6′ 6″	NA	.....	Gr	.....	NA	$8950	NA
Monsted-Vincent Aero Inc. New Orleans, La.	Starflight	5	[4]Continental	85	2575	S. L.	Sen	72	158	6000	150	6000	....	....	1020	.....	5000	3200	48′	34′	13′	NA	NA	NA	NA	NA	.....	*
Mooney Aircraft, Inc. Wichita, Kan.	M–18L	1	Lycoming	65	2550	S. L.	Sen.	66	132	S. L.	115	S. L.	650	1100	385+	25,000	780	490	26′ 11″	17′ 7″	6′ 3″	Ko, SW	.....	.....	.....	.....	$2300	....
Piper Aircraft Corp. Lock Haven, Pa.	PA–11	2	Continental	90	2475	S. L.	Sen	72	112	S. L.	100	S. L.	475	900	350	18,000	1220	750	35′ 3″	22′ 4″	6′ 7″	NA	.....	.....	.....	.....	$2572	578
	PA–14	4	Lycoming	108	2600	S. L.	Sen	74	123	S. L.	110	S. L.	1770	600	500	14,500	1850	1025	35′ 6″	23′ 3″	6′ 4″	NA	Bmt	Gr	.....	Del	$3825	192
	PA–17	2	Continental	65	2300	S. L.	Sen	72	100	S. L.	90	S. L.	1570	530	250	12,000	1150	650	29′ 3″	18′ 7″	6′	NA	.....	.....	.....	.....	$2175	514
	Piper–Stinson	4	Franklin	165	2800	S. L.	Sen	76	133	S. L.	130	5000	....	580	554	.....	2400	1320	34′	25′ 2″	7′ 6″	NA	Ha	Gr	GE	Del	$6440	49
	Piper Clipper	4	Lycoming	108	2600	S. L.	Sen	73	125	S. L.	112	S. L.	1910	600	480	13,500	1650	850	29′ 3″	20′ 1″	6′ 2″	NA	.....	.....	.....	Del	$2995	....
Ryan Aeronautical Co. Lindbergh Field, San Diego, Calif.	Navion	4	Continental	185	2600	S. L.	Har	84	163	S. L.	155	3500	875	900	500	21,000	2750	1730	33′ 5″	27′ 3″	8′ 8″	US, SW[11]	RCA	Gr	Gr	Del	$10-965	506
Sanders Aviation, Inc. and Engineering & Research Corp. P. O. Box 26, Riverdale, Md.	Ercoupe Club–Air	2½	Continental	85	2575	S. L.	Sen	71	125	S. L.	110	S. L.	1850	500	430	14,000	1400	838	30′	21′	5′	NA	Le	Gr	.....	Del	$4090	....
	Ercoupe Standard	2	Continental	75	2275	S. L.	Sen	74	120	S. L.	105	S. L.	1600	700	450	16,000	1260	800	30′	21′	5′	NA	.....	.....	.....	Del	$3590	....
Schweizer Aircraft Corp. Elmira, New York	Midget–Mustang	1	Continental	85	....	2575	Sen	58	200+	S. L.	170+	S. L.	610	1500	410	24,000	850	525	18′ 6″	16′	4′ 6″	Ai, Ko	.....	.....	.....	.....	$4995	....
Sentinel Aircraft, Inc. Ann Arbor, Mich.	L–5	2	Lycoming	190	2550	S. L.	Sen	84	130	S. L.	107	6000	800	1050	350	18,000	2140	1700	33′	24′	.....	NA	NA	NA	NA	NA	.....	....
Taylorcraft, Inc. Alliance, Ohio	BC12D–65	2	Continental	65	2350	S. L.	Lw, Sen	70–72	105	S. L.	95	S. L.	....	550	400	17,500	1200	775	36′	22′	4′ 6″	NA	.....	.....	.....	.....	$2365	86
	BC12D–85	2	Continental	85	....	S. L.	Lw	70–72	.....	.....	100+	S. L.	....	600	400	19,000	1280	800	36′	22′	4′ 6″	NA	.....	.....	.....	.....	$2585	22
Texas Engineering & Mfg. Co., Inc. Grand Prairie, Tex.	GC–1B	2	Continental	125	2550	S. L.	Sen, Aer	73	150	S. L.	140	S. L.	993	1000	425	17,500	1710	1185	29′ 4″	20′ 11″	6′ 1″	Ko	GE	Gr	.....	Del	$4495	270
Thorp Aircraft Co. P. O. Box 326, Pacoima, Calif.	Model T–11	2	Lycoming	65	2800	S. L.	Sen	66	115	S. L.	107	7000	800	600	400	15,000	1050	565	25′	17′	7′ 6″	Ko	.....	.....	.....	.....	.....	*

*not yet in production
Aer—Aeromatic
Ai—Airpath
Auto—Autolite
Bch—Beech
Be—Bendix
Bmt—Belmont
Del—Delco Remy
GE—General Electric
Gr—Grimes
Ha—Hallicrafter
Ham—Hamilton Standard
Har—Hartzell
HW—Harvey Wells
Ko—Kollsman
Le—Lear
Lw—Lewis
Mc—McCauley
MD—McDowell
NA—information not available
Pi—Pioneer
Sen—Sensenich
Sh—Schwien
SNR—supplied but make not reported
SW—Stewart Warner
US—US Gauge

[1] No wind S. L. takeoff at gross weight over 50 ft. obstacle.
[2] Aqua I is Prototype of Aqua II which is still in the preliminary design stage. Aqua II will have two 185 hp. Continental or 190-hp. Lycoming engines.
[3] Takeoff on water.
[4] Service ceiling.
[5] Cruisair Estate Wagon same as model listed plus removable seats and cargo tie-down provisions, price $7285.
[6] Turbojet designed by Cal Aero.
[7] Also equipped with 26.5 hp. Crosley engine for auto unit.
[8] Data shown are for 8F Special; 8F Deluxe is equipped with fibre glass soundproofing in cabin area, removable seats, tie-down rings, starter, generator, battery, position and landing lights, and a more complete set of cockpit controls.
[9] Data shown are for Observer Special; Observer Deluxe is equipped similarly to the 8F Deluxe. Price is $3195.
[10] Removable seats.
[11] Plus instruments made by US Gauge, Airpath, L. N. Schwien, Scott, Elgin and King-Seeley.

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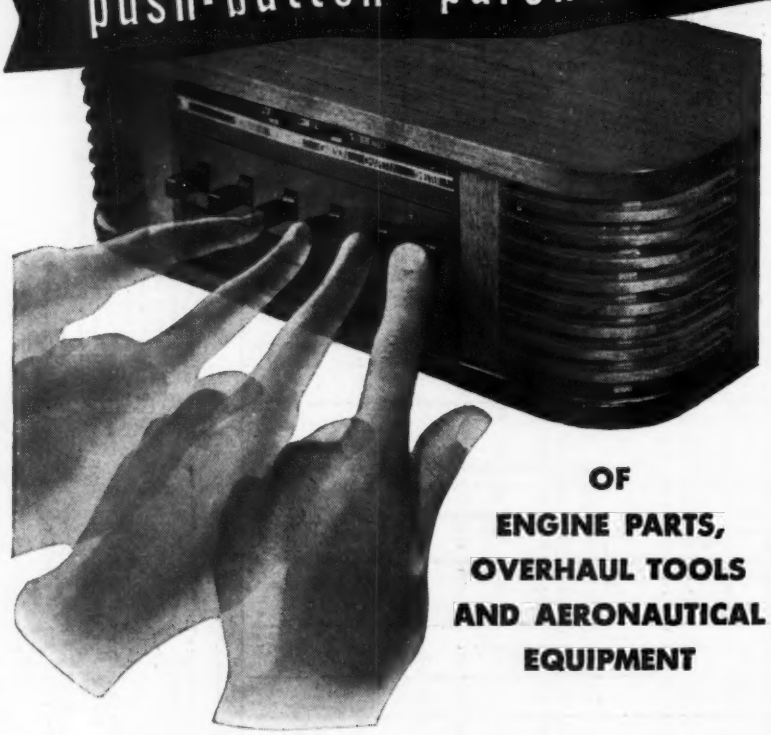

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Class 6	6700 to 7699 ft.
Class 7	7700 to 8699 ft.
Class 8	8700 to 9699 ft.
Class 9	9700 ft. and up

effort to get the appropriation raised.

▶ **Specific Project**—Difference between the $62,092,244 in grant offers, and the total of $117.5 million appropriated is in money that has been already earmarked for specific projects but which has not yet been finally obligated in grant offers.

Two factors are seen as causes for faster CAA action on airport funds in the past year: greater familiarization with the processes to be accomplished, and some simplification of involved CAA procedure.

▶ **Simplification**—State aeronautics agencies and local sponsors can take credit for bringing about much of the simplification. Numerous heated conferences resulted in a "streamlining" last March in which some eight forms were eliminated, and in which the project application and the sponsor's assurance agreement were consolidated.

Supplementary airport aid programs developed by many of the state aeronautics agencies have also contributed materially to the sponsors' shares of airport financing and encouraged many local communities to apply for airport projects which they might not have been able to finance single-handed.

State funds have also been made available for numerous small airport projects which did not seek federal aid and these have contributed materially to the total number of airports.

State aviation gasoline taxes long fiercely opposed by airlines and other operators of aircraft, are being used in some of the states to finance their state airport aid, while other states make appropriations from general funds.

▶ **Examples**—Two typical state airport aid programs are those of a New England and a Western state:

Massachusetts reports allotments of $696,756 from state funds to go with $1,558,030 in federal funds toward a total airport expenditure of $3,021,285. This will be used for design, construction and improvement of 12 municipal airports, the balance to be paid by local sponsors.

Utah has a 29 project airport pro-

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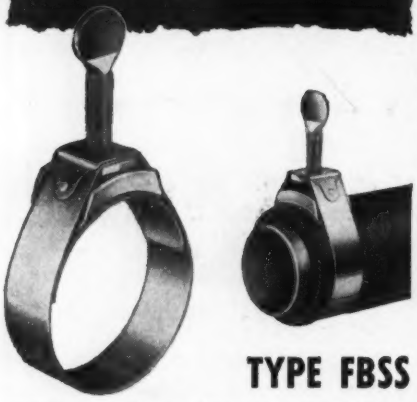

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gram at a total cost of $2,525,339 for which the U. S. contributes $1,502,057 and the sponsors $1,023,282. Utah legislature has appropriated $500,000 for state airport aid. Policy has been adopted that the state will match contribution of a local sponsor up to a $25,000 limit fixed by law, and that in addition it will advance if needed for the local sponsor an amount equal to the current value of the airport, but not to exceed $10,000.

Development of commercial airports, financed with business capital, and still the largest single class of airports, has slowed appreciably. This is largely attributable to the concerted and apparently successful effort by the U. S. Veterans Administration officials to kill the GI flight training program.

Type of Airports by States

Jan. 1, 1949

(Data covers existing airports recorded with the CAA)

STATE	TOTAL	TYPE[1]				
		Commercial	Municipal	CAA Intermediate	Military	All Others
Total	**6,414**	**2,989**	**2,050**	**161**	**398**	**816**
Alabama	97	43	32	2	15	5
Arizona	187	43	40	5	44	55
Arkansas	91	46	30	0	0	15
California	463	193	142	9	39	80
Colorado	101	33	44	3	3	18
Connecticut	33	23	10	0	0	0
Delaware	20	15	2	0	1	2
District of Columbia	3	0	0	0	2	1
Florida	208	50	93	2	55	8
Georgia	141	51	51	5	11	23
Idaho	109	13	56	3	2	35
Illinois	177	130	31	3	4	9
Indiana	169	129	30	1	5	4
Iowa	183	101	50	3	2	27
Kansas	202	87	86	3	11	15
Kentucky	67	43	12	1	2	9
Louisiana	95	27	30	4	6	28
Maine	73	39	24	0	3	7
Maryland	52	30	5	0	7	10
Massachusetts	80	53	21	0	4	2
Michigan	235	115	109	0	5	6
Minnesota	123	53	70	0	0	0
Mississippi	94	39	35	6	4	10
Missouri	119	67	40	5	3	4
Montana	101	16	58	10	1	16
New Hampshire	32	16	12	0	1	3
New Jersey	93	71	11	0	5	6
New Mexico	111	31	33	11	8	28
New York	276	178	47	2	8	41
North Carolina	151	93	35	1	13	9
North Dakota	91	38	47	6	0	0
Ohio	251	195	34	4	4	14
Oklahoma	165	71	79	2	5	8
Oregon	115	37	44	4	0	300
Pennsylvania	225	174	39	3	5	4
Rhode Island	11	7	2	0	2	0
South Carolina	67	20	37	2	5	3
South Dakota	68	23	41	1	1	2
Tennessee	78	41	23	7	2	5
Texas	624	192	156	21	70	185
Utah	59	7	37	8	4	3
Vermont	23	12	9	0	1	1
Virginia	127	69	23	2	14	19
Washington	164	56	69	4	11	24
West Virginia	52	35	11	2	0	4
Wisconsin	157	91	56	1	2	7
Wyoming	55	14	26	5	1	9

[1]Airport type definitions: **Commercial**—Public use and public services, privately owned, & operated. **Municipal**—Public use and public services, municipally owned and/or operated. **CAA Intermediate**—Public emergency use, no services, CAA operated. **Military**—Public restricted military operated. **All Others**—(a) Public emergency use only, no public services, privately owned for personal use; (b) Public emergency use only, no public services, Government-owned Forest Service, etc. Source: CAA.

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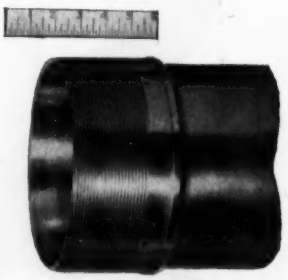
Close-up of pivot tube, showing an inside threading operation that requires the best equipment and skill available.



Piston for Martin P4M-1, with close-up of thread grinding on the hardened steel.

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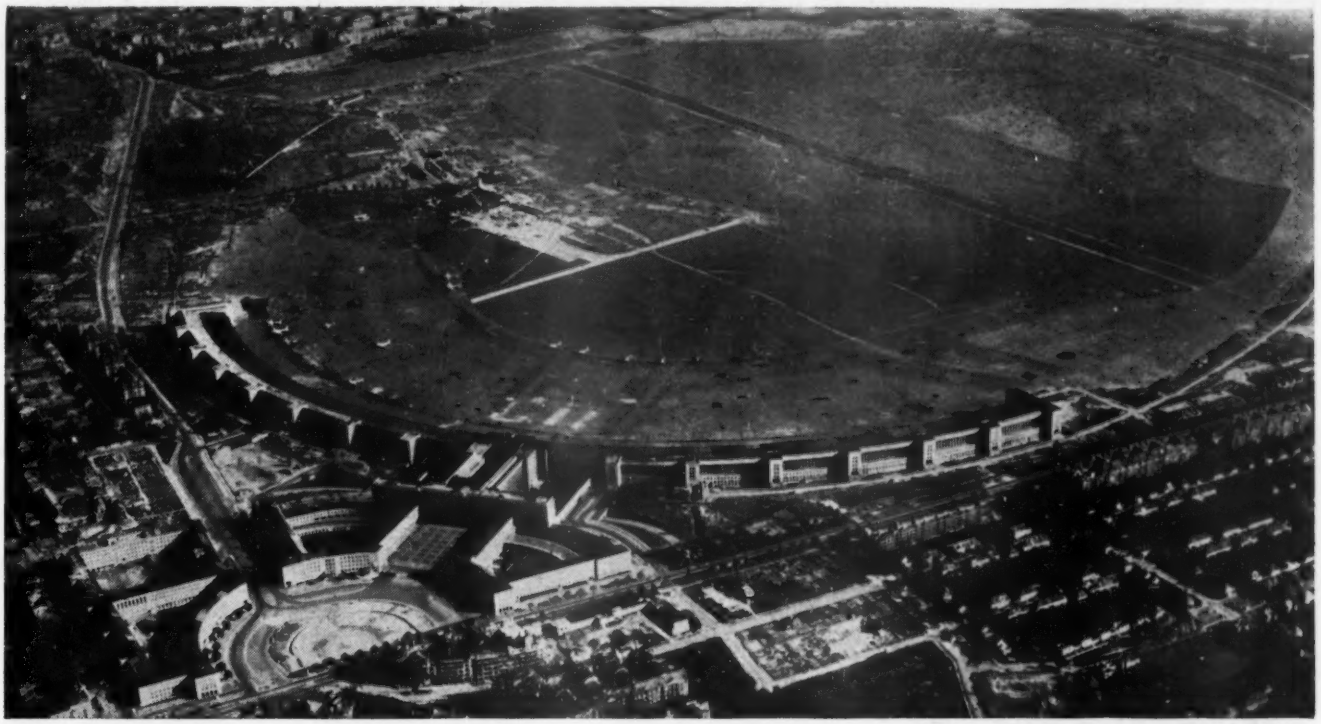

Templehof—Berlin terminal for the airlift. Mammoth administration building (foreground) has 5000 offices.

Berlin Airlift: Transport Air Power in Action

From spectacular achievements has sprung hope that strategic transport will be built to first-class strength.

By Charles Adams

Military and commercial air transport, which were relegated to a Cinderella role by U. S. defense planners prior to the Russian blockade of Berlin, have assumed their rightful position in the limelight through the history-making achievements of "Operation Vittles."

The Berlin blockade simultaneously spotlighted the strength and limitations of U. S. strategic airlift capacity. More important, it has given promise that some of the most glaring transport weaknesses will be corrected and the danger of developing a first-string combat Air Force supported by second-string air transport will be eliminated.

▶ **MATS Takes Over**—Burden of Operation Vittles fell on the Military Air Transport Service less than a month after it came into official existence through consolidation of the Air Force's Air Transport Command and the Naval Air Transport Service. Normally, MATS' duties involve unspectacular (and often unappreciated) scheduled airline operations over established routes. With the Berlin crisis, MATS overnight assumed its other important responsibility—strategic airlift.

When Operation Vittles began last June, the small fleet of C-47s used by the USAF's European Air Transport Service and miscellaneous RAF transports took over the airlift burden but could feed only a trickle of supplies into Berlin. Now, MATS has about 225 C-54s (and five Fairchild Packets in reserve) flying the corridors into the German capital. Seventy-five other aircraft are constantly passing through the maintenance pipeline.

▶ **Weather No Obstacle**—Most significant is the fact that during most of the German winter there has been little or no relation between weather and tonnage handled. Berlin's requirements of 4500 tons of supplies daily are being met. MATS officials describe Operation Vittles as "the greatest air transport operation the world has yet seen."

During the first seven months of the blockade, U. S. aircraft used in Operation Vittles flew 145,255,000 ton miles. By comparison, U. S. certificated domestic trunklines flew only about 136,438,000 ton miles of freight, express and mail in all of 1948.

▶ **Strain on Resources**—But MATS has not achieved its success without strain, and at times has been close to faltering under the load. The airlift has involved a heavy drain on MATS' personnel and equipment. Requirements of Operation Vittles have made necessary extensive realignment and curtailment of MATS' service in other parts of the world.

MATS states that a replacement and modernization program for its planes over the next five years is imperative. "Obsolescence of our C-54s is such that by July, 1952, the entire fleet will be composed of second-line types," MATS has informed the Secretary of Defense.

▶ **Large Planes Required**—Maj. Gen. Laurence S. Kuter, MATS commander, emphasizes that the future of U. S. strategic airlift lies in the development and production of big transports with these characteristics: Ease of maintenance, high utilization, direct loading and unloading, useful capacity of about 25 tons, range of 3000-4000 miles and low cost of operation.

Speed of the craft should be about 250 mph., according to Kuter. But he cautions that "in this era of jet and

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supersonic flight it is important not to transfer this emphasis on speed to the field of air transport, where it is a secondary consideration."

▶ **Air Force Orders Transports**—Kuter has voiced encouragement at the recognition given to big transport planes through Air Force orders for the Boeing C-97 Stratofreighter and the Douglas C-124 (a version of the C-74 Globemaster capable of handling bulkier loads). The MATS commander has called for a unified effort by the military, the airlines, the aircraft industry and the public to support development of "a great national fleet of large transports which will earn their way in commerce, contributing in peace to national prosperity and to national defense in time of emergency."

Without this expansion of the national merchant fleet, MATS would be helpless to provide the tremendous airlift which is sure to be one of the first requirements of any major emergency, Kuter declared.

▶ **Prototype Legislation**—Congress again has before it legislation authorizing a huge program to build up the U. S. fleet of cargo aircraft. Bills introduced recently by Sen. Edwin Johnson (D., Colo.), chairman of the Senate Interstate and Foreign Commerce Committee, and by Rep. John Kennedy (D., Mass.) would authorize the government to develop and purchase new cargoplanes for leasing to the airlines. Rep. Lindley Beckworth (D., Tex.) has offered a measure authorizing the government to spend up to $50 million a year on financial aid for plane development.

On the Republican side, Sen. Owen Brewster and Rep. Carl Hinshaw have re-introduced bills authorizing the government to pay prototype costs of new commercial transport and cargo craft. Similar bills embodying recommendations made a year ago by the President's Air Policy Commission and the Congressional Aviation Policy Board were before the last Congress but did not receive Senate approval in the rush for adjournment.

▶ **Airlift Deficit Cited**—Need for prototype legislation to build up the commercial cargo fleet is seen in MATS' statement that its present strategic lift capacity is three-quarters of a billion ton miles annually, compared to a requirement of seven and one-half billion annual ton miles if a national emergency arises. If all civilian strategic aircraft (largely four-engine types) were made available they would provide MATS with an additional lift of one and one-half billion ton miles annually, making a total of two and one-quarter billion.

MATS estimates that ten percent of this lift would be required for route support, leaving about two billion ton miles to be applied to the annual requirement. The result is a deficit in strategic airlift of five and one-half billion annual ton miles.

▶ **Stratofreighters Purchased**—Recognizing the attrition on MATS' transport fleet as a result of Operation Vittles, the Air Force recently diverted money earmarked for other purposes to permit purchase of 23 additional C-97A Stratofreighters. Boeing previously had a production order for 27 C-97s, making a total of 50 now on order by the USAF. The Air Force already has taken delivery on 10 service test YC-97s. Stratofreighters can carry a 43,000 lb. load and have a 300 mph. cruising speed.

USAF also has 30 Douglas C-124s, capable of handling 50,000 lb., on order. The Air Force has taken delivery on 13 Douglas C-74 Globemasters, from which the C-124 design is derived. Twelve Globemasters have been utilized on trans-Atlantic runs in support of Operation Vittles but are not used on regular schedules into Berlin.

MATS emphasizes that a task force made up of 68 C-74s, C-124s or C-97s could carry 4500 tons of supplies into Berlin daily. In contrast, it takes 178 C-54s carrying 19,400 lb. loads or 899 C-47s carrying 6800 lb. loads to do the same job. Bigger, faster aircraft mean impressive economies all along the line—fewer trips, flying hours, air crews, maintenance personnel and gallons of fuel used.

▶ **Airline Reserve Inadequate**—At present, the commercial airlines lack the large-type cargo planes required to beef up MATS in case of a larger emergency. Fortunately, MATS has not been forced to call on the airlines to turn over equipment for use in Operation Vittles, although both certificated and uncertificated carriers have flown a number of trans-Atlantic trips under contract in support of the Berlin airlift.

As of Jan. 1, 1949, U. S. scheduled domestic and international airlines had only 104 cargo or combination cargo-passenger transports. Of these, but 65 were four-engine types—all C-54s. Remainder were C-47s and C-46s.

Significantly, not one of the large new cargoplanes required by MATS is on order by a commercial airline. A study of all four-engine civil aircraft on the Civil Aeronautics Administration's records shows the U. S. has about 275 non-military C-54s or DC-4s, 109 DC-6s and 75 Constellations, plus miscellaneous craft such as Boeing Stratoliners and Boeing 314 flying boats.

Twin-engine civil transports, usually considered non-strategic by MATS, are plentiful. There are about 920 DC-3s alone.

▶ **Vittles Advances Techniques**—But lessons learned from the Berlin airlift may contribute importantly to the growth of U. S. commercial air strength. A

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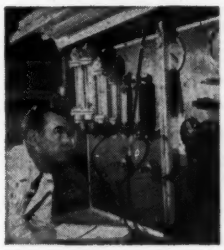

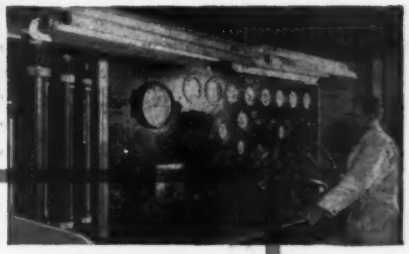

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1 Split-second control for fuel, air, oxygen, alcohol, water, oil, etc., full line size opening—no restriction.

2 Opening time adjustable from ¼ to 5 sec.; closing time, less than 1/10th sec.

3 Suitable for operating temperatures of −65° to 550° F.

4 Valve is operated by *Hydro-Aire-developed,* holding-type solenoid...instantaneous current drain during operation only.

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FROM THE ENGINEERING laboratories of Hydro-Aire comes still another advanced design for today's aircraft. Designed as a pneumatic shut-off valve for use with air-driven water injection pumps, it is being successfully adapted for use wherever long life and extreme fast action are required. It is a good example of the outstanding aircraft parts made possible by the engineering, testing and production facilities of the world's largest producer of aircraft fuel valves. Your inquiry on this, and other Hydro-Aire products, will bring prompt data, without obligation.

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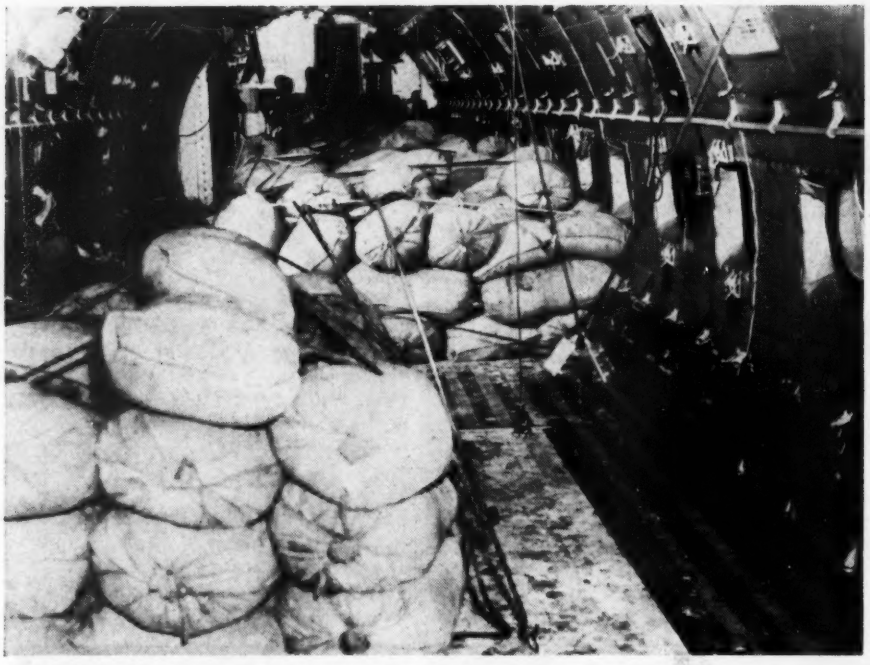
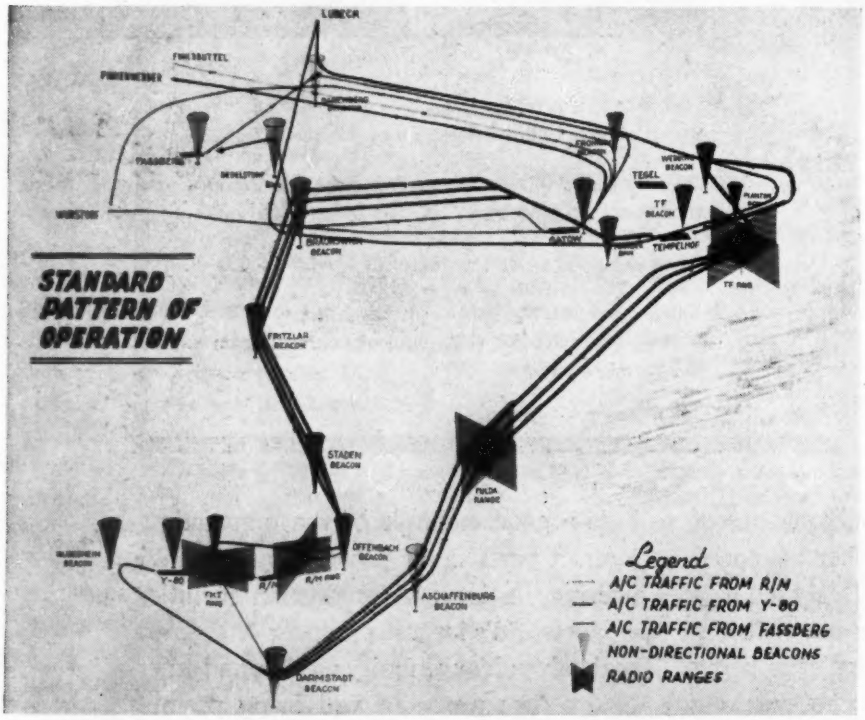


Twenty-five tons of flour were piled into this Douglas C-74 Globemaster and firmly lashed down preparatory to the flight along the air corridor into blockaded Berlin. The C-74 carried the largest individual loads into the German capital and was especially valuable in moving heavy airstrip-building equipment too bulky to be loaded in a C-54. But planes of this type are not used regularly in the Berlin corridor. Instead, they have been placed in service over the North Atlantic in support of "Operation Vittles".



Airlift traffic along the corridors to Berlin is shown in this chart of Operation Vittles. Courses of planes flying to and from the German capital from bases in Western Germany are indicated together with the radio beacons and ranges used as aerial navigation aids. R/M indicates the Rhein-Main airport and Y-80 is the Wiesbaden field, both located in the American sector. Fassberg is in the British sector.

Civil Aeronautics Board technical observer, Col. Robert V. Garrett, who recently made a first-hand study of Operation Vittles, reported he was particularly impressed by: (1) The application of new methods of air traffic control; (2) the necessity for and value of flight engineers on four-engine aircraft; (3) flight crew confidence in and precision use of GCA-radar landing-aid equipment; and (4) proof that standardized flight instrument panels make training and operational flying easier and safer.

On the Berlin run, the USAF operates schedules over one-way airways with planes as close as three minutes apart and with 500 ft. vertical separation. A method of air traffic control has been instituted which eliminates stacking of aircraft in a holding pattern while awaiting clearance to land. This is a complete departure from the accepted method of air traffic control practiced in the U. S.

Each aircraft missing an approach to Berlin executes a departure procedure and returns to its point of takeoff so as not to interrupt following flight schedules. But missed approaches are so few as to be or little consequence on the airlift, according to Col. Garrett.

► **Flight Engineers Valuable**—All of the C-54 air crews on the Berlin run are composed of pilot, copilot and flight engineer. USAF believes that addition of a flight engineer allows the pilot to give his undivided attention to his instruments, thereby resulting in safer takeoffs, climb enroute, approaches and landings. Duties assigned to the flight engineers also include minor maintenance work in flight and constant checking on the plane's mechanical condition before, during and after flight.

All of the C-54s are equipped with standardized flight instrument panels. Col. Garrett noted that U. S. air carriers and manufacturers have been unable to agree on a standardized cockpit, or even a standardized flight instrument panel, for civil transports. While some progress in this direction has been made by airlines adopting a company-standardized flight instrument panel, there is still no uniformity between air carriers.

►**GCA Takes Spotlight**—Ground controlled approach (GCA-radar) is the standard instrument approach and landing system used on the airlift. The instrument landing system (ILS), which is the standardized instrument approach and landing system at more than 75 U. S. airports, is not used on the Berlin operation.

GCA is used by the USAF on all low visibility approaches at the four airports dispatching C-54s into Berlin and at the three airports receiving the planes inside the German capital. As many as three C-54s at one time are under GCA control in final approach.

► **Old Types Reliable**—The GCA installations at the seven airports are MPN-1s, or variations of that type. These are the oldest-type GCA units in use, having been manufactured in 1943-1944; and all of them have had several thousand hours service without major overhaul. They require four men on duty at all times. A new two-man

PLANE FAX

How Glendale's Sky Roamers reduced engine maintenance cost 53%

Recently, the Sky Roamers Flying Club of Glendale, California, sent the engine of their Continental 85 Powered Cessna 140 to the shop—*after 1005½ hours service without repair*—for a checkup.

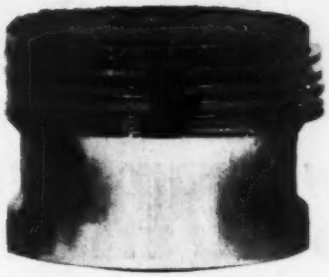
"It was still running quietly, had no stuck rings or valves and was using only one quart of RPM Aviation Oil in eight hours," is the astonishing report of Mr. James H. Brown, secretary-treasurer of the club.

"Our previous Continental 85 engine, using two other aviation oils, stuck rings three times in 798 hours. Engine maintenance cost was $.535 per hour.

ENGINE: CONTINENTAL 85 hp
OIL USED: R P M

Ring belt area free of deposit after 1005½ hours —

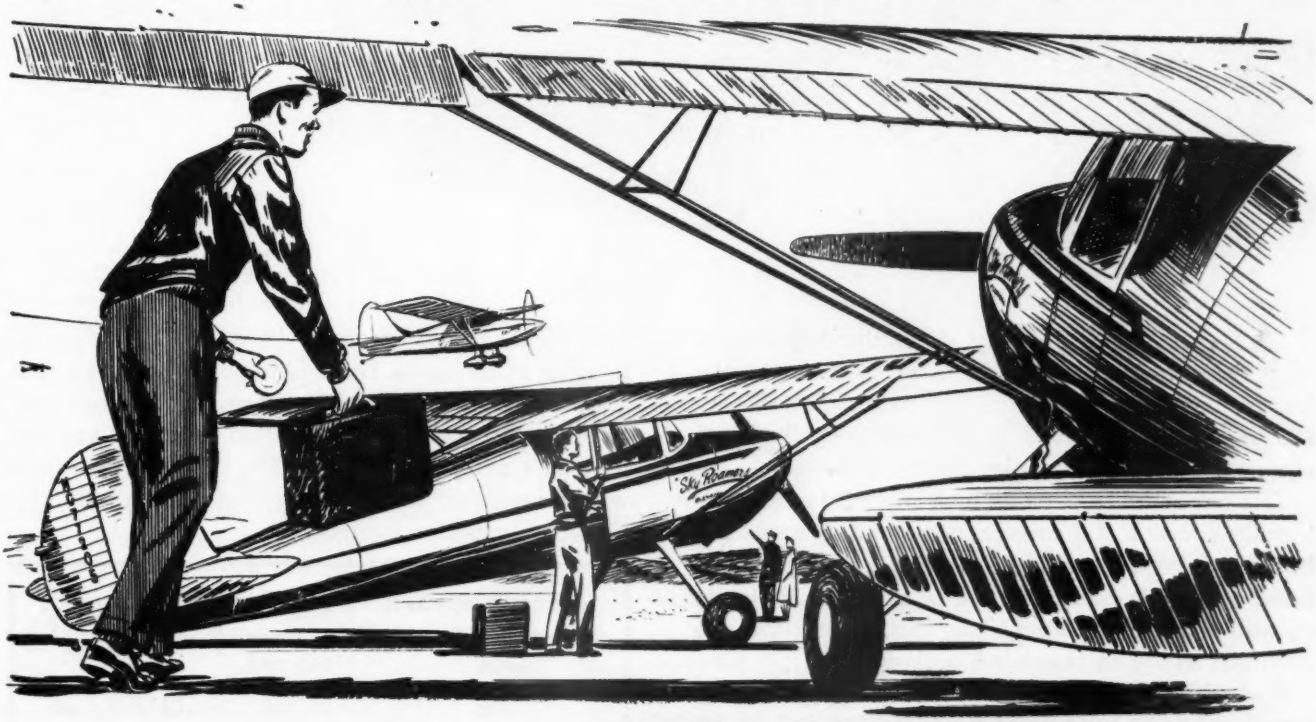
Ran four times longer than the longest run using other oils —



—Prevention of stuck rings and valves gives maximum service at $.248 per hr.

"Using RPM Aviation Oil, with no ring or valve jobs," concludes Mr. Brown, "reduced cost to $.248 per hour."

REMARKABLE, ISN'T IT, how the special detergent in "RPM" keeps belt areas free from deposits? And another compound in "RPM" makes it cling to hot upper cylinder walls . . . left bare and exposed to wear by ordinary oils. Result: "RPM" often *doubles* the period between overhauls!



Handling your brakes correctly?

When you use brakes excessively, without allowing them time to cool they may not hold when you need them in case of an emergency. It's a good idea to always test your brakes while taxiing before take off, and use them as little and as lightly as possible while taxiing. Even more important, inspect them *regularly*.

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NEW BENDIX-PACIFIC AN-6248-1 3000 PSI HYDRAULIC HAND PUMP

Extra ruggedness —a characteristic of all Bendix-Pacific hydraulic hand pumps—is an outstanding feature of the new Model 469100 (approved as AN-6248-1) for 3000 PSI systems. The pump weighs 1.95 pounds.

This dependable ¾ cubic inch capacity pump materially exceeds AN construction requirements. The body is a permanent mold casting and the forged handle socket is designed to resist extreme side loads as well as high operating loads and to withstand the roughest usage in restricted cockpits.

A double-acting piston producing approximately equal volume on the in and out strokes and an integral suction check valve employing the proven Bendix laminated phenolic poppet are additional features of the pump. These poppets give long service and can be replaced without lapping or other preseating operations. Pre-lubricated bearings provide lifetime wear-free operation. The pump is available with or without handle. Complete data gladly furnished to qualified companies.

THE FOLLOWING 3000 PSI PUMPS ARE NOW AVAILABLE:

Bendix Assembly	*Description*
469100	AN 6248-1
403950-0-1	AN 6248-1 except ⅜ suction port
410850	AN 6248-1 with telescoping handle
410860	AN 6248-1 with 18" handle

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GCA unit (CPN-4) is being installed at Berlin's Tempelhof Field.

Besides two MPN-1 type GCA units in use at Tempelhof, a new type surveillance radar unit (CPS-5), a microwave, early-warning installation with moving target indicator, began operating during December, 1948. Located on top of the Templehof administration building, this new unit can control airlift traffic within a 100-mile radius of the field.

The moving target indicator records only moving objects, thus eliminating stationary masses, known as ground clutter, which appear on the scope of older radar units. Range of the new unit permits it to be used for controlling aircraft into all three airports in Berlin.

MATS' Gen. Kuter states that GCA used in Operation Vittles is working about five times as rapidly as ever before. He quoted Garrett as saying that Operation Vittles has advanced the art of air traffic control by 10 years. USAF safety mark on the Berlin airlift is considerably better than the overall Air Force record.

Loading and unloading Operation Vittles C-54s is largely a manual affair performed by 12 to 15 displaced persons supervised by USAF enlisted personnel. Work is arranged to insure that no plane spends more than 40 minutes on the ground.

▶ **Cycled Reconditioning** – Maintenance-wise, all 50 hr. checks on C-54s are performed in Germany, and 200 hr. checks in England. For the 1000-hr. overhaul, the planes are flown back to the U. S. C-54 utilization on the airlift averages 8½ hr. daily.

MATS had completed plans for introduction of cycled reconditioning of aircraft before Operation Vittles began. But the emergency has provided an unexpectedly good opportunity for giving this type of maintenance a thorough test.

Gen. Kuter says MATS is already convinced that for best utilization of maintenance facilities, progressive overhaul definitely has the advantage over conventional preventive maintenance.

Planes In Use

While newer transport types increase, DC-3 is still the workhorse.

U. S. airlines are operating a record number of planes in scheduled domestic and foreign service.

At the beginning of 1949, carriers were using about 1061 aircraft for regular flights, compared to 971 a year before, CAA statistics show. Total at the start of 1947 were around 809.

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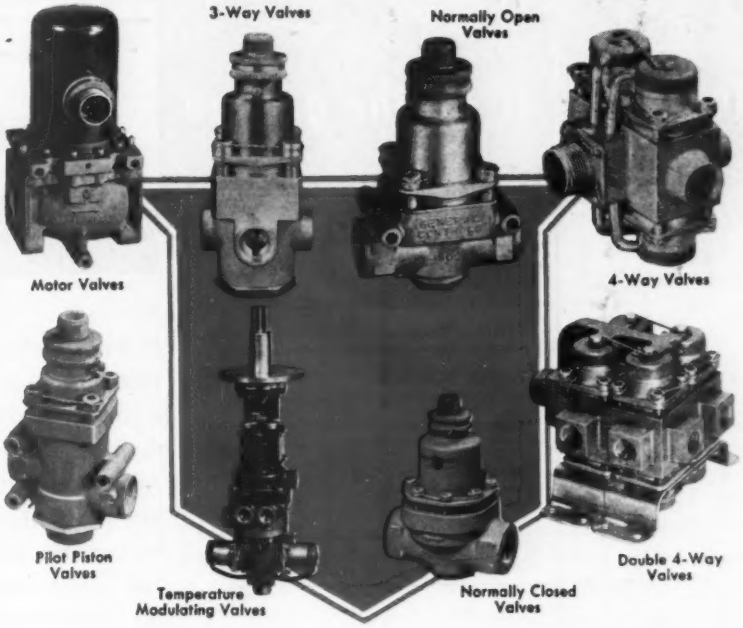

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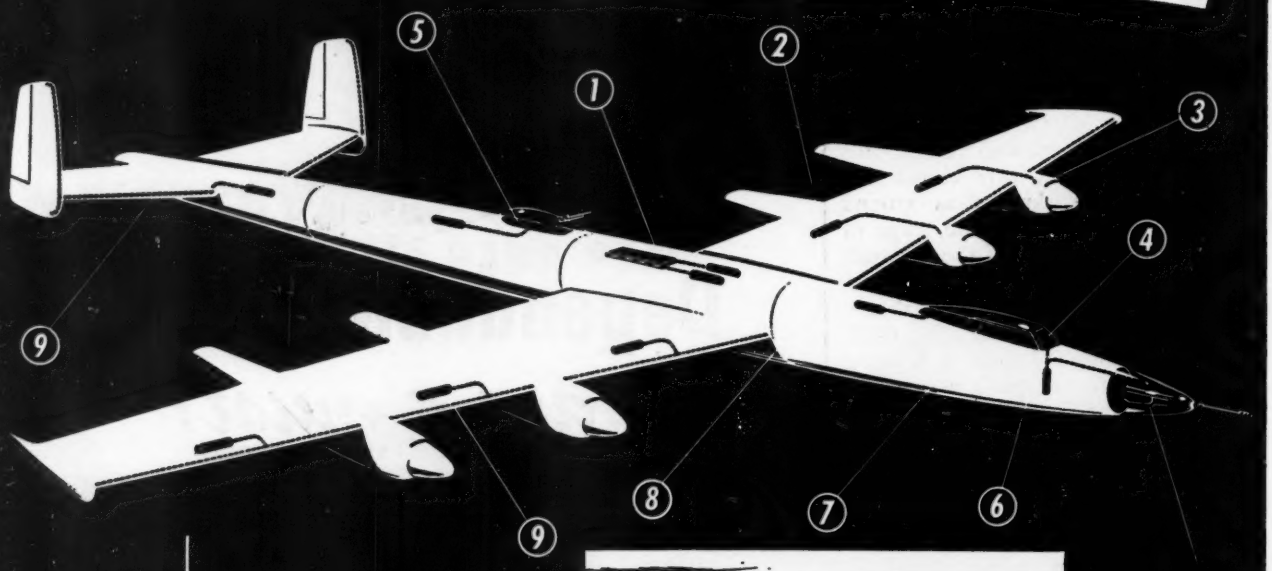
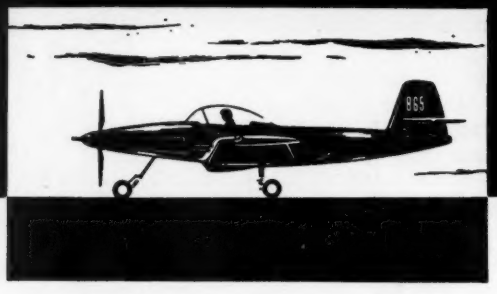


in flight or on the ground



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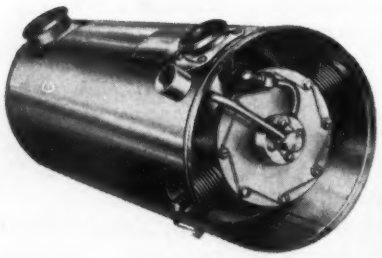

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U. S. Transport Aircraft

Manufacturer	Designation	Capacity: Number of crew	Capacity: Number of passengers	Capacity: Cargo capacity (cu. ft.)	Powerplant: Number and make of engines	Powerplant: Takeoff hp.	Powerplant: At rpm. at sea level	Powerplant: Normal rated hp.	Powerplant: At rpm.	Powerplant: At altitude (ft.)	Powerplant: Make of propellers	Powerplant: Diameter	Performance: High speed, mph.	Performance: At altitude (ft.)	Performance: Cruising speed, mph.	Performance: At altitude (ft.)	Performance: Takeoff distance[1] (ft.)	Performance: Landing distance[2] (ft.)	Performance: Landing speed, mph.	Performance: S. L. climb at gross weight (fpm.)	Performance: S. L. climb with one engine inoperative (fpm.)	Performance: Normal range, mi.	Weights: Gross weight, lb.	Weights: Empty weight, lb.	Dimensions: Span	Dimensions: Length	Dimensions: Height to tip of fin	Direct operating cost per (passenger) (ton) mile
Beech Aircraft Corp.	Twin-Quad*	3	20	.....	4 Lycoming	375	.....	.....	.....	.....	HS	10′ 7″	230	8000	180	8000	.....	.....	.....	.....	.....	1450	19,500	.....	70′	53′	17′	.....
East Central Ave.;	D-18-C	2	5-7	.....	2 Cont. R-9A	525	.....	500	2300	SL	HS	.....	240	5000	224	10,000	1530	1490	77	1250	.....	1500	9000	5900	44′ 7″	32′	9′ 3″	.....
Wichita 1, Kan.	D-18-S	2	5-7	.....	2 P & W B4	450	2300	450	2300	2300	HS	.....	230	5000	212	10,000	1650	1390	77	1250	.....	1500	8500	5680	44′ 7″	32′	9′ 3″	.....
Boeing Airplane Co.	Model 377[3]	5	55-80	845	4 P & W R-4360	3500	2700	2800	2550	21,500	C, HS	16′ 8″	375	25,000	300+	25,000	5400	5870[4]	85	1230	660	4600	142,000	83,500	141′ 3″	110′ 4″	38′ 3″	1.07¢/pas.
Box 3107,	Stratocruiser																											
Seattle 14, Wash.																												
Consolidated Vultee Aircraft Corp.	Model 240	3-4	40	435	2 P & W R-2800-CA18	2400	2800	1800	2600	16,000	C, HS	13′ 1″	336	13,500	291	16,000	4050	4150	89	1450	285	625	40,500	26,416	91′ 8″	74′ 8″	26′ 11″	1.32¢/pas.
San Diego, Calif.;	Convair-Liner																											
Douglas Aircraft Co., Inc.	Super DC-3[5]	3	26-29	1520[6]	2 Wr 1820-C9HE	1475	2800	1275	2500	3500	HS	11′ 6″	271	5900	239	10,000	4010	3840	73	1470	.....	2405	28,300	18,494	90′	67′ 8″	14′ 11″[7]	1.1¢/200 lb.
3000 Ocean Park Blvd.,	DC-4	3	44	.....	4 P & W 2 SD 13 G	1450	2700	1200	2550	5000	HS	13′ 1″	246	20,800	231	12,200	3980*	2763*	100*	1090	435	4250	73,000	40,200	117′ 6″	93′ 5″	27′ 7″	.....
Santa Monica, Calif.	Skymaster																											
	DC-6	5	52-58	541	4 P & W CA-15	2100+	2800	1800	2600	6500	C	13′ 1″	358	19,600	315	20,400	5410	5060	107	1175	680	2350	93,200	51,250	117′ 6″	100′ 7″	28′ 5″	.85¢/pas.
	DC-6A	2	.....	5000	4 P & W CA-15	2100+	2800	1800	2600	6500	C	13′ 1″	347	19,300	304	20,300	6100	5450	112	1040	550	2000	100,000	48,500	117′ 6″	105′ 7″	28′ 5″	4.4¢/ton
	Air-Freighter																											
Glenn L. Martin	2-0-2	3-4	36	281	2 P & W R-2800-CA18	2400	2800	1800	2600	.....	HS	13′ 1″	311	14,000	286	12,000	1565	1720[8]	76	2200	560	635	39,900	25,086	93′ 3″	71′ 4″	28′ 5″	.....
Baltimore 3, Md.	2-0-2 Cargo	2	.....	2240	2 P & W R-2800-CA19	2400	2800	1800	2600	.....	HS	13′ 1″	309	13,500	281	12,000	1730	1860[8]	80	2030	400	3890[9]	43,000	24,201	93′ 3″	71′ 4″	28′ 5″	.....
Grumman Aircraft Engineering Corp.	G-73	2	10	.....	2 P & W R-1340-S3H1	600	2250[10]	550	2200	5000	HS	8′ 3″	215	8000	180	8000	1280	.....	71	1190	290	627	12,500	9125	66′ 8″	48′ 4″	18′ 9″	.....
Bethpage, L. I., N. Y.	Mallard																											
Lockheed Aircraft Corp.	Constellation 049	6	30-64	434[11]	4 Wr 745 C18BA3	2200	.....	2000	2400	4800	HS	15′ 2″	340	.....	300+	.....	2800	2500	80	.....	.....	5000+	86,250	51,000+	123′	95′ 1″	23′ 8″	.....
2555 No. Hollywood Way,	Constellation 649	5-7	46-64	434[11]	4 Wr 749 C18BD1	2500	2800	2100	2400	4400	C, HS	15′ 1″	350+	19,200	300+	23,000	3000	2600	80+	1270	649	4800+	92,000	58,000+	123′	95′ 1″	23′	.....
Burbank, Calif.	Constellation 749	5-7	50-64	434[11]	4 Wr 749 C18BD1	2500	2800	2100	2400	4400	C	15′ 1″	350+	19,200	300+	23,000	3100	2800	80+	1270	649	4600	102,000	58,474	123′	95′ 3″	23′	7.5¢/ton

C—Curtiss Electric
HS—Hamilton Standard
P&W—Pratt & Whitney
Wr—Wright
Cont.—Continental

* Data shown are approximate.
[1] No wind, sea level takeoff at gross weight over 50 ft. obstacle.
[2] Landing over 50 ft. obstacle.
[3] Boeing 377 Stratofreighter—cargo version of the Stratocruiser—has a 7004 cu. ft. cargo capacity and a direct operating cost of 4.2¢ per ton mile. Performance is identical to that of the passenger model.
[4] 5000 ft. with reversible props
[5] Alternate Super DC-3 has P&W R-2000-D5 engines and an empty weight of 18,525 lb.
[6] Pounds
[7] To top of fuselage
[8] With reversible props
[9] Maximum range
[10] At 3000 ft.
[11] With Speedpak installed, available cargo space is 834 cu. ft.

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▶ **Workhorse Still in Harness**—The DC-3 continues to be used more than any other transport in scheduled service. About 478 of these workhorses were operated on regular domestic and international flights at the start of 1949. There were 513 in use a year before.

DC-4s in service declined from 264 at the beginning of 1948 to 246 at the start of this year. But newer transport types were appearing in greater numbers.

▶ **Newer Transports Increase**—About 109 DC-6s were being used on Jan. 1, 1949, against 86 a year before. Model 649 Constellations in service decreased from 18 to 13 in the 12-month period, but Model L-49 Connies still numbered 44 and Model 749 "Gold Plate" Constellations increased from none to 16.

No Convair-Liners were in scheduled service at the start of 1948, but 88 were in use at the beginning of this year. Martin 2-0-2s—all operated by Northwest Airlines—increased from nine to 24.

▶ **Fleets Compared**—Other planes in regular operation on Jan. 1, 1949, with the Jan. 1, 1948, totals in parentheses, are: Lockheed Lodestar, 12 (12) Lockheed 10A, 6 (none); Boeing Stratoliner, 5 (5); Stinson, 7 (7); Beech D-18C, 6 (6); Sikorsky S-51 helicopter, 5 (3), and Curtiss C-46, 2 (none). The Lodestars are all operated by National Airlines, the Lockheed 10As by Wisconsin Central Airlines, the Boeing Stratoliners by TWA, the Stinsons by All American Aviation on its pickup routes which will be suspended this year, the Beech D-18Cs by All American and Florida Airways, the Sikorsky S-51s by Los Angeles Airways, and the C-46s by National.

Boeing 247-Ds left the listings in the past year. Empire Air Lines, a feeder, had four during 1947.

▶ **Cargo Equipment Survey**—CAA reported that 104 all-cargo or combination cargo-passenger planes were included among the 1061 transports in scheduled service Jan. 1, 1949. Of these, 18 were C-54As, 27 C-54Bs, 20 C-54Gs, 6 DC-3s, 12 DC-3As, 19 DC-3Cs, and 2 C-46Fs. Sixty-six of the planes were in service domestically, most of them exclusively in cargo work.

Of the 38 cargo and combination planes reported by U. S. overseas and international carriers, 33 belonged to Pan American Airways. None of PAA's aircraft in the cargo and combination category were fitted out exclusively for cargo, according to the CAA study. Recently Pan American added to its fleet 10 C-46 airfreighters leased from the Air Force.

Among the domestic operators, United Air Lines and American Airlines had the largest all-cargo fleets in scheduled service at the start of 1949. The UAL fleet included four C-54As, one

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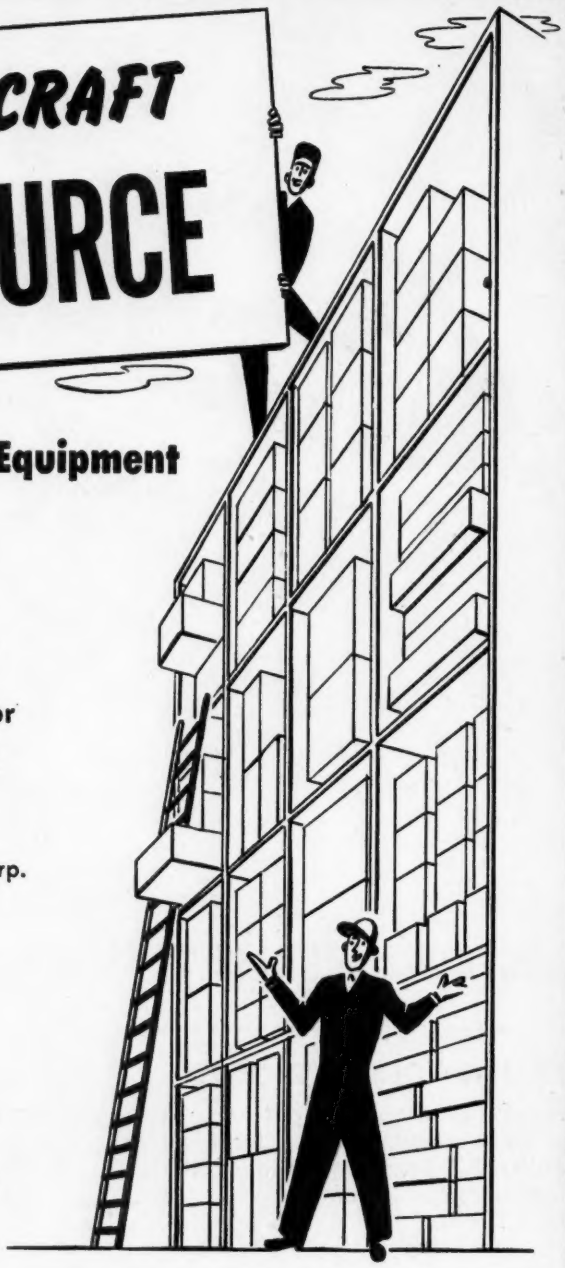

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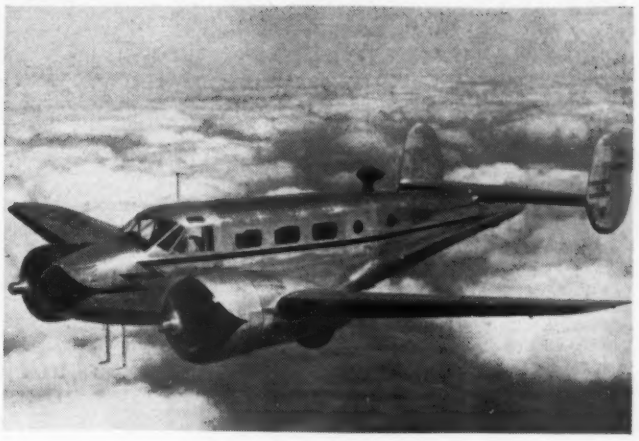
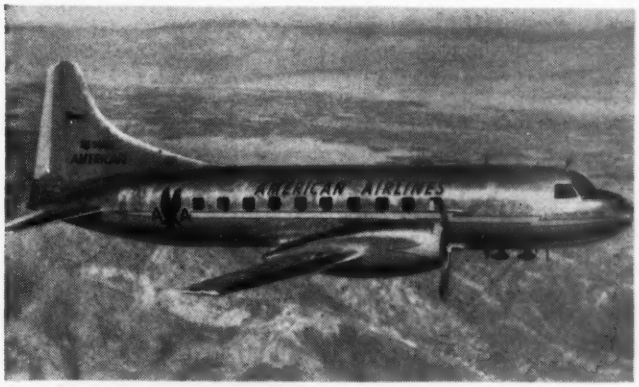
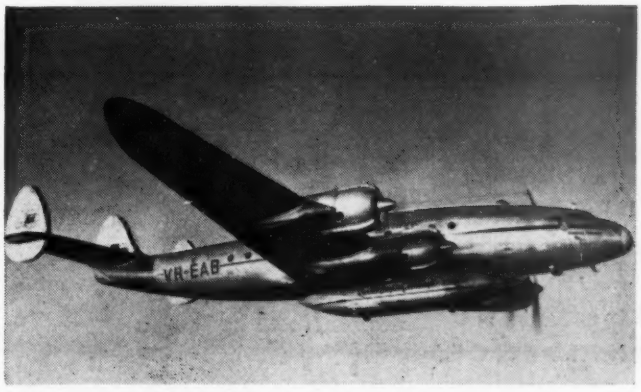


Beechcraft D-18-S



Convair-Liner (240)

Beechcraft Twin-Quad



Lockheed Constellation

Grumman Mallard

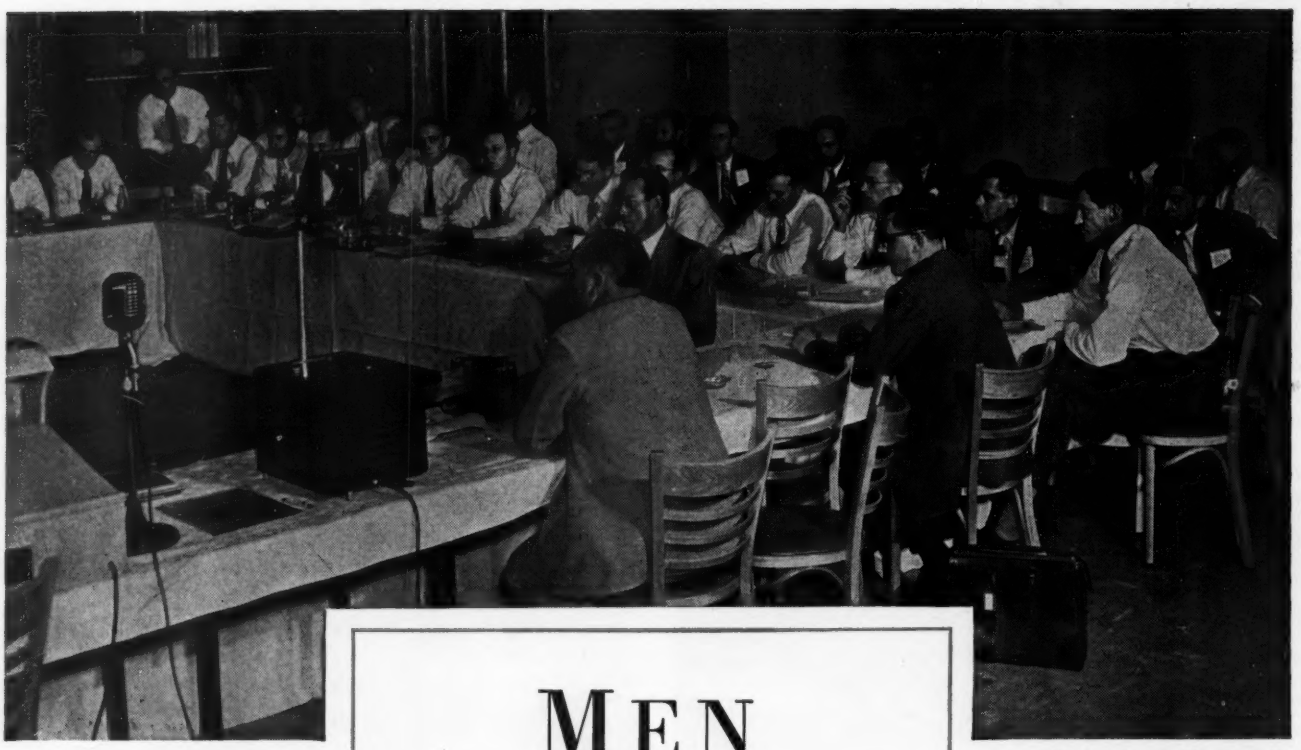


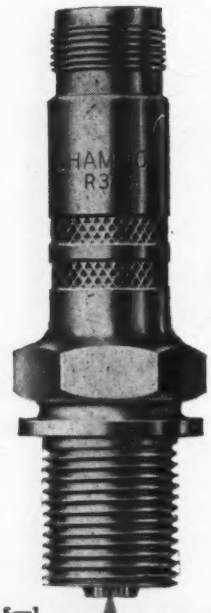
Photo taken at Champion 4th Annual Aircraft Ignition Clinic

MEN
in shirt sleeves

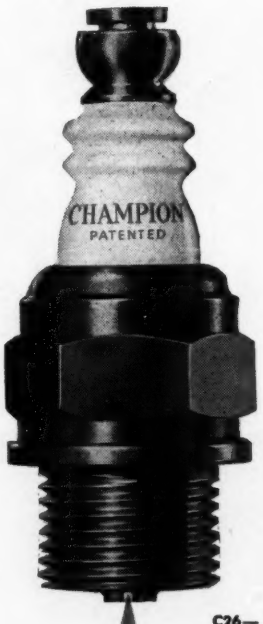
For the past four years, it has been the privilege of the Champion Spark Plug to play host, annually, to a group of aircraft maintenance and service engineers from the armed services, leading air lines, and engine manufacturers. This annual three-day Aircraft Ignition Clinic is truly a "shirt sleeves" session which has been highly productive of constructive information and procedure for both our guests and ourselves.

This union of research, engineering and manufacturing experience, with equally broad experience in ignition problems as they occur in operation and maintenance, has been of great benefit to our own research and engineering, and has, from the expressions of our guests, been of equally great value to them.

Out of it, we believe, come better, more dependable Champion Spark Plugs for every aircraft engine, and every operating and maintenance condition.



R 37 S—1
Actual Size
Shielded Type



C26—
Unshielded
Actual Size 2⅜"

FOLLOW THE EXPERTS

USE CHAMPIONS AND FLY WITH CONFIDENCE

C-54B, two C-54Gs, eight DC-3As and seven DC-3s. AA had eight C-54Bs, five C-54As and one DC-3.

Cargo craft which are used by uncertificated carriers such as Slick Airways and The Flying Tiger Line are not included in CAA studies of scheduled air carrier operations.

Airline Transports in Scheduled Service

(Domestic and Foreign Operations)

Jan. 1, 1949

Trunklines	DC-6	DC-4	DC-3	Others	Total
Alaska	..	..	4		4
American	50	29	34	53 Convair-Liners	166
American Overseas	..	9	1	7 L-49 Constellations	17
Braniff	6	9	15		30
Capital	..	23	25		48
Carib Atlantic	..	..	3		3
Chicago & Southern	..	5	13		18
Colonial	..	2	10		12
Continental	..	..	12	5 Convair-Liners	17
Delta	5	7	19		31
Eastern	..	19	52	13 L-649 Constellations	84
Hawaiian	..	..	12		12
Mid-Continent	..	..	18		18
National	4	7	..	12 Lockheed 18s, 2 C-46s	25
Northeast	..	2	8		10
Northwest	..	17	5	24 Martin 2–0–2s	46
Pacific Northern	..	1	3		4
Panagra	5	3	12		20
Pan American	..	65	23	4 L-749 Constellations, 14 L-49s and 20 Convairs	126
TWA	..	12	69	12 L-749 Constellations, 23 L-49s, 5 Stratoliners	121
United	39	30	78		147
Western-Inland	..	6	13	10 Convair-Liners	29
Feederlines					
Challenger	..	..	4		4
Empire	..	..	4		4
Florida	..	..	..	4 Beech D-18Cs	4
Monarch	..	..	5		5
Piedmont	..	..	6		6
Pioneer	..	..	9		9
Robinson	..	..	4		4
Southwest	..	..	9		9
Trans-Texas	..	..	6		6
West Coast	..	..	2		2
Wisconsin Central	..	..	..	6 Lockheed 10As	6
Others					
All American	..	..	..	7 Stinsons, 2 D-18Cs	9
Los Angeles Airways	..	..	..	5 Sikorsky S-51s	5
	109	246	478	88 Convair-Liners	1061
				44 L-49 Constellations	
				24 Martin 2–0–2s	
				16 L-749 Constellations	
				13 L-649 Constellations	
				12 Lockheed 18s	
				7 Stinson SR10s	
				6 Beech D-18Cs	
				6 Lockheed 10As	
				5 Boeing Stratoliners	
				5 Sikorsky S-51s	
				2 Curtiss C-46s	

Source: Civil Aeronautics Administration.

On-Time Record

U. S. scheduled airlines set new records for regularity and dependability in 1948 and expect to show further improvement this year through increased use of GCA, ILS and radio navigation aids.

Typical of the progress made against delays last year was the on-time performance of United Air Lines. In 1948, UAL's on-time arrivals were 40 percent greater than in 1947. The company operated 96 percent of all scheduled flights, flying 59,500,000 plane miles.

During the last six months of 1948, UAL trip arrivals within 15 minutes of scheduled time increased about 21 percent over the first half of the year, while the number of flights completed over an hour late decreased 46 percent. For the year as a whole, almost 70 percent of all flights arrived on time or within 15 minutes of scheduled time.

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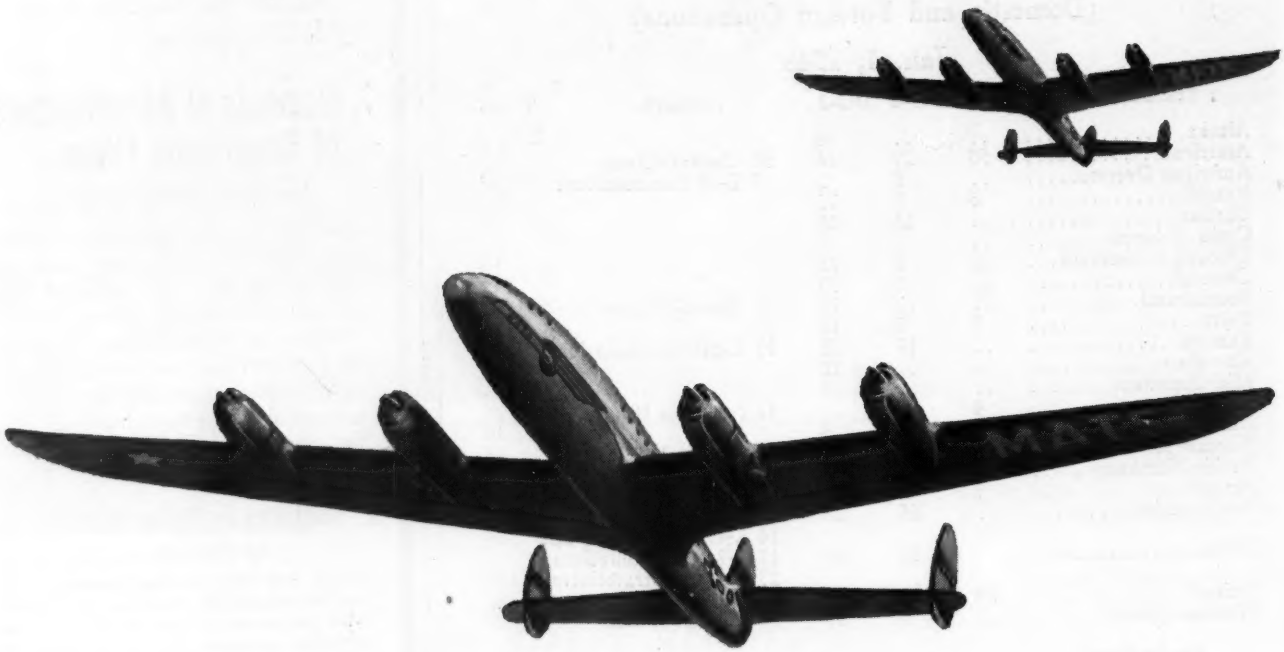

Meet the Lockheed C-121*

* This is the U. S. Air Force version of the famous Lockheed Constellation. Tried and proven in 4,000 *million* passenger miles on the world's commercial air routes, the swift Constellation has been made available to the Military Air Transport Service (MATS) for the more important flying tasks of the all-important science of logistics.

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FOR LEADERSHIP

Lockheed Aircraft Corporation

Burbank, California

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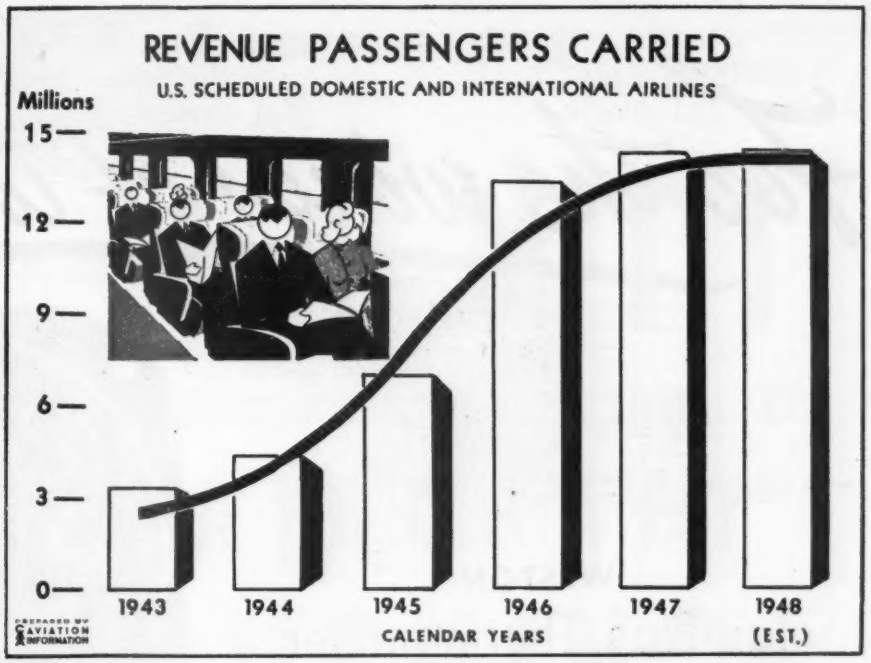
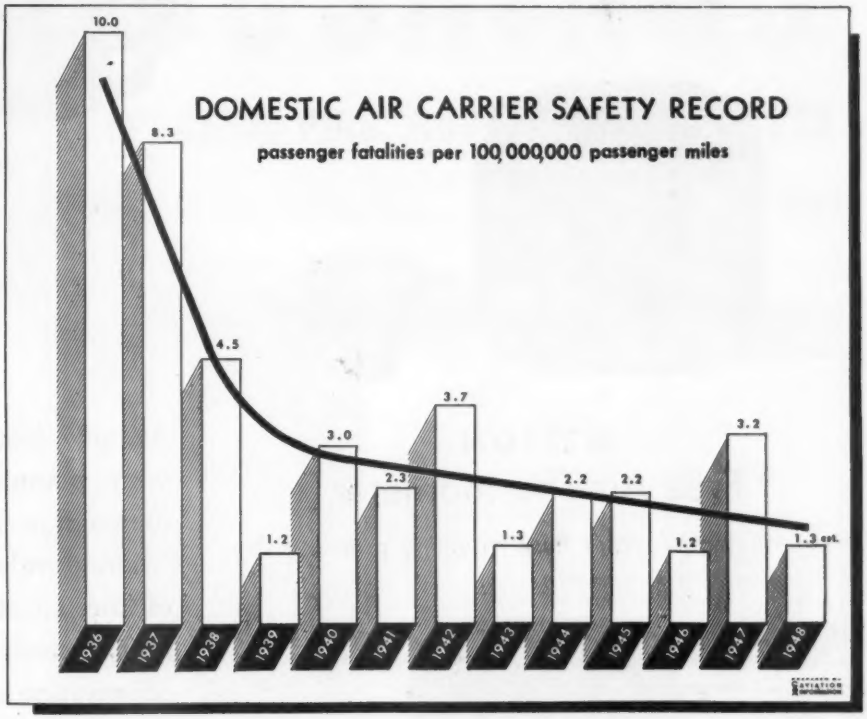
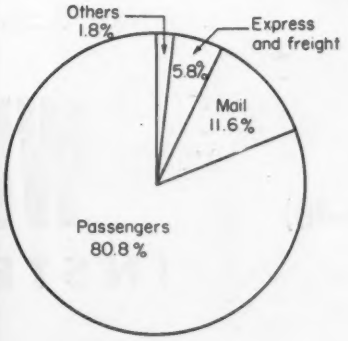
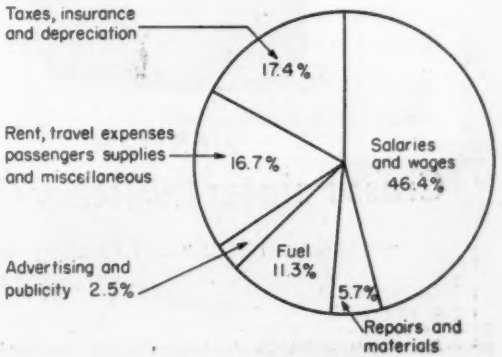




DOMESTIC AIRLINE REVENUES AND EXPENSES
(Estimates for 1948)



REVENUES



EXPENSES

For the wings of tomorrow

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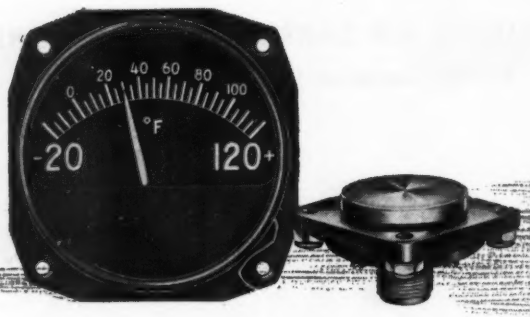
—used on the new jet power plants



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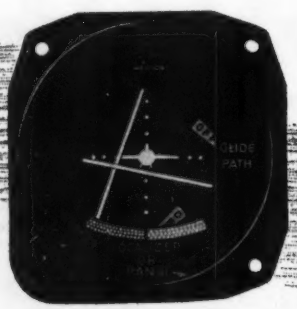
—featuring Weston's flush mounting resistor bulb



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Route Miles

U. S. airlines still lead, but superiority margin steadily declines.

U. S. carriers still lead the rest of the world—including Russia—in scheduled airline operations. But the margin of America's global supremacy has declined steadily since the end of World War II.

A study of CAB's Foreign Air Transport division shows that U. S. domestic operators on Oct. 1, 1948, accounted for 40 percent of the world's scheduled plane miles flown, and American flag carriers accounted for another 12 percent. This 52 percent share of global airline services compares with 59 percent for the U. S. in October, 1947, and 64 percent in October, 1946, when Russian figures were not available.

▶ **Russian Operations**—Last fall, the Russians were scheduling about 1,327,000 plane miles weekly on both foreign and domestic services. This was less than 8 percent of the worldwide total, against the U. S. share at that time of 52 percent.

Among 225 airlines surveyed by CAB (including 174 foreign companies and 51 certificated U. S. and Alaskan carriers), American operators also stand out on the basis of individual size. The world's ten largest airlines from the standpoint of scheduled plane miles flown weekly in October, 1948: TWA 1,421,477, Aeroflot (Russian) 1,327,476, American Airlines 1,236,480, Pan American Airways 1,207,854, United Air Lines 1,199,739, Eastern Air Lines 949,092, BOAC 520,587, KLM 516,446, Air France 458,083, and Northwest Airlines 396,535.

▶ **U. S. Holds Leadership**—Plane miles scheduled per week by U. S. domestic carriers totaled 6,946,000 on Oct. 1, 1948, compared to 6,686,000 on Oct. 1, 1947, and 6,691,000 on Oct. 1, 1946. U. S. flag carriers flew 2,030,000 scheduled plane miles weekly on Oct. 1, 1948, against 1,941,000 on Oct. 1, 1947, and 1,213,000 on Oct. 1, 1946.

Thus U. S. domestic carriers showed a modest 4 percent gain in scheduled operations for the two-year period. By contrast, U. S. international carriers had a 67 percent increase in services between 1946 and 1948.

Combined domestic and international services of scheduled foreign carriers (excluding Russia) soared from 4,436,000 scheduled plane miles in October, 1946, to 7,124,000 in October, 1948. This represents an increase of more than 60 percent. With the Russians flying an estimated 1,327,000 scheduled plane miles weekly last October, the world

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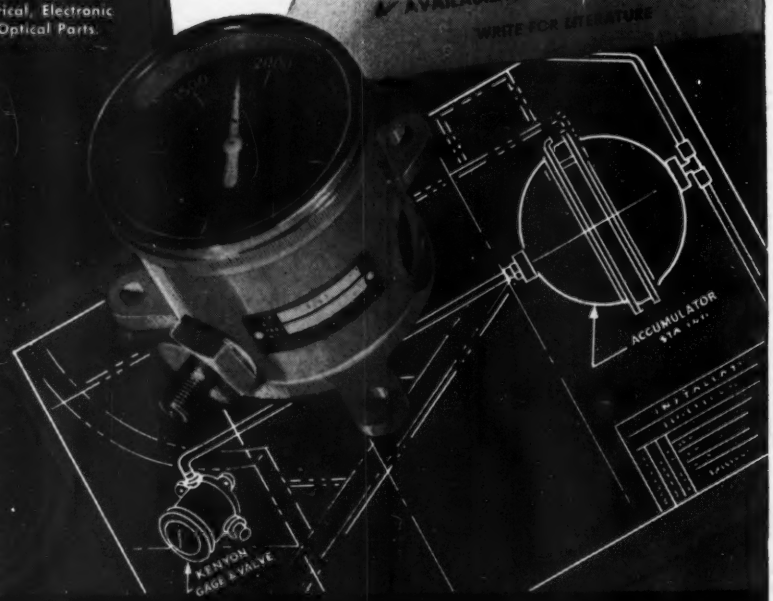

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total comes to 17,427,000 plane miles weekly.

▶ **Soviet Carrier Studied**—Domestic services account for about 95 percent of Aeroflot's operations. Aeroflot (Civil Air Fleet Administration) operates all the scheduled passenger, mail and cargo services in the Soviet Union.

Aviation Research Institute, publisher of the World Aviation Annual, reports that Aeroflot's passenger services are largely restricted to daytime flights. Even on the 4300-mile run between Moscow and Khabarovsk, one of the few routes flown with four-engine IL-18s, schedules allow for two overnight stops.

Fares for Aeroflot's typical passenger trips of 500 to 1000 miles average about 7½ cents a mile considerably higher than U. S. domestic trunkline rates, according to the Institute. This is about one and one-half times the fare by reserved sleeper in Soviet express trains and roughly three times the lowest Russian coach train fares for comparable trips.

▶ **Large Cities Lack Service**—Aeroflot's network of routes provides regular service to 103 points within the U.S.S.R. and 16 points in neighboring countries. At least eight Russian cities of over 200,000 population have no scheduled service, the Institute states.

Altogether about 114 flights daily were scheduled to and from Moscow during the peak summer season last year. These flights were divided among three airports. By comparison, Washington National Airport last August averaged 323 scheduled plane arrivals and departures per day.

▶ **Figures Discounted**—Early in 1948, the Russians were claiming in radio broadcasts that their airline network had grown to about 124,000 miles and was expected to reach 137,000 miles by the end of the year. The Aviation Research Institute reports that these figures include substantial duplicated mileage and actually give a very distorted picture of the true extent of the Soviet's scheduled service.

But even on the basis of unduplicated route mileage as compiled by CAB, Aeroflot is the world's fifth largest carrier. Ranked in order of unduplicated route miles operated on Oct. 1, 1948, the top ten airlines are: Air France 64,560, BOAC 57,280, KLM 53,270, Pan American Airways 52,245, Aeroflot 41,635 Scandinavian Airlines System 31,778, Sabena 31,191, Panair do Brasil 24,892, Philippine Air Lines 24,636 and Qantas Empire Airways (Australia) 20,793.

▶ **Global Totals Listed**—U. S. domestic carriers as a group operated 68,000 unduplicated route miles in October, 1948, compared with 60,000 a year before and 53,000 in October, 1946.

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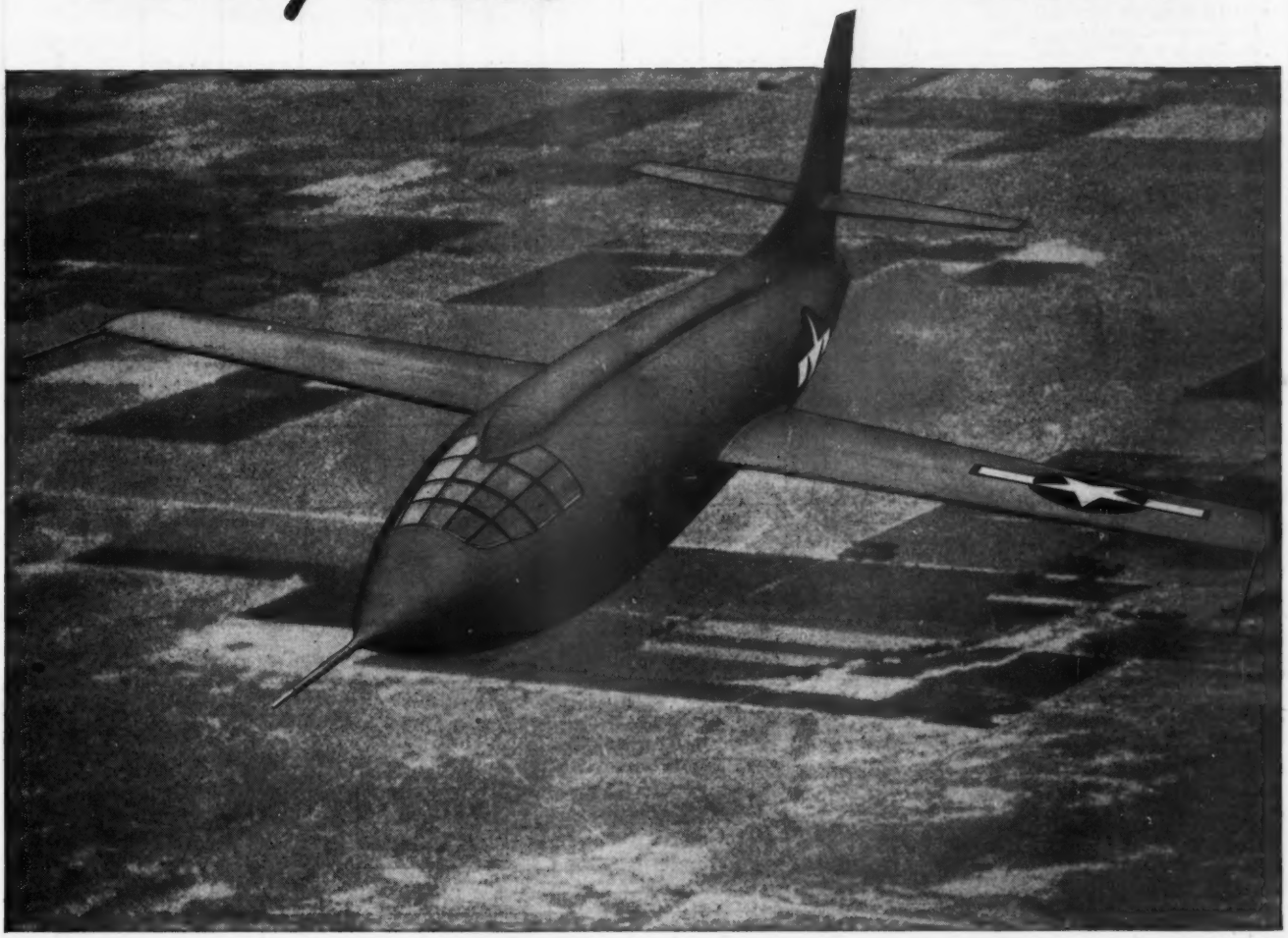

"Hundreds of miles" faster than the speed of sound is the speed attained by the Air Force–Bell X-1. This plane is literally a flying research laboratory designed to help engineers explore the problems of flight at subsonic, transonic, and supersonic speeds.

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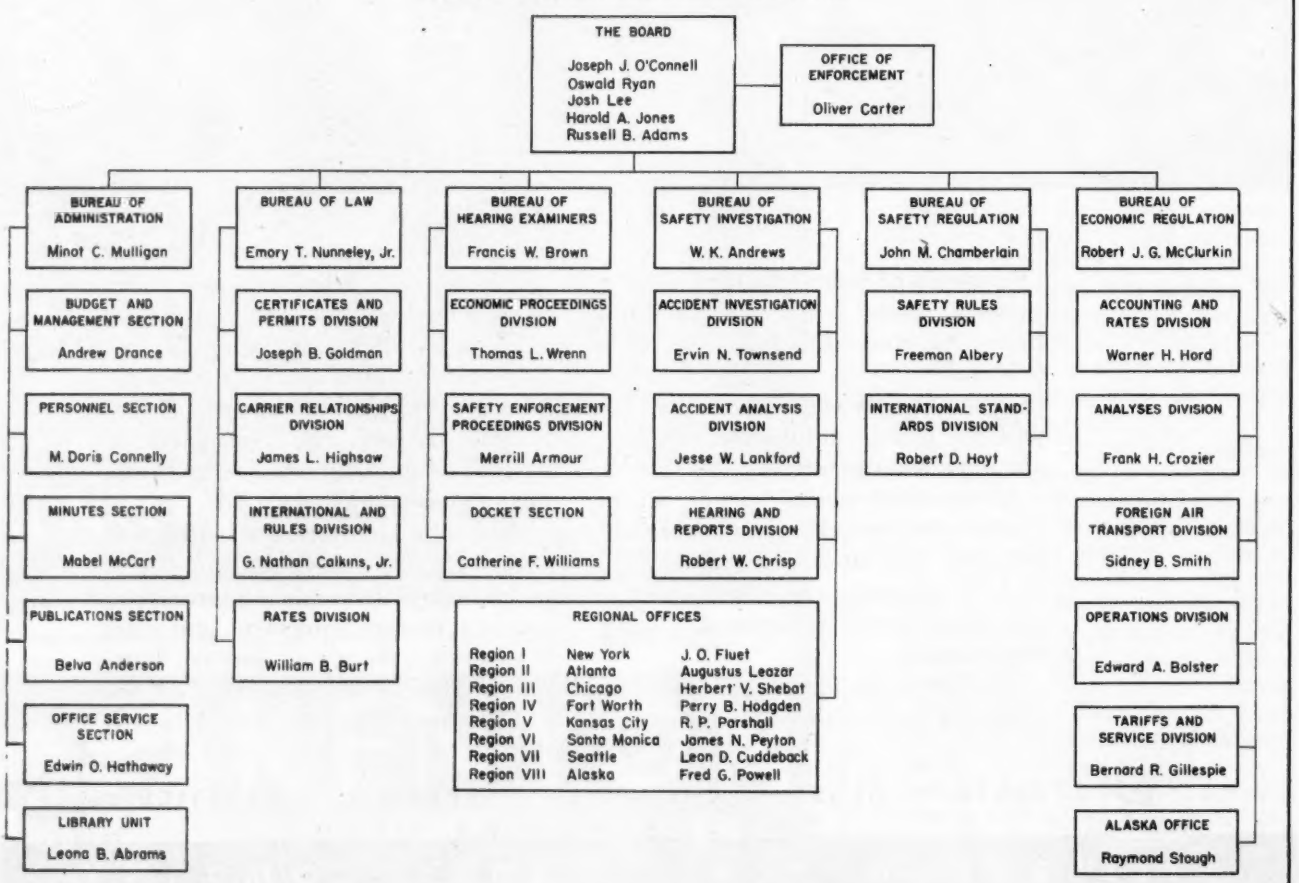
Nonscheduled (Irregular) Air Carrier Aircraft

REGION	1	2	3	4	5	6	7	8	9	TOTAL
Multi-Engine Aircraft										
Make—Model—Approx. Gross Weight										
Boeing 314–A 80,000	1	.....	.....	.....	.....	.....	.....	.....	.....	1
Douglas DC–4 73,000	20	.....	.....	1	.....	50	.....	5	.....	76
Curtis C–46 45,000	2	16	.....	.....	.....	15	6	1	.....	40
Douglas B–23 27,500	.....	.....	2	.....	.....	.....	.....	.....	.....	2
Consolidated 28–4 27,000	.....	4	.....	.....	.....	1	.....	1	.....	6
Douglas DC–3 25,200–26,900	83	96	22	3	13	68	25	24	9	343
Douglas B–18 23,200	.....	5	5	.....	.....	.....	.....	.....	.....	10
Douglas DC–2 18,560	.....	.....	1	.....	.....	.....	.....	.....	.....	1
Lockheed 18 17,500–18,500	3	14	17	1	1	1	1	.....	.....	38
Lockheed 14 17,500	.....	.....	5	.....	.....	.....	.....	.....	.....	5
Boeing 247 13,500	.....	.....	.....	.....	.....	.....	.....	2	.....	2
Grumman G–73 12,500	3	.....	.....	.....	.....	.....	.....	.....	.....	3
Ford Trimotor 10,130–13,500	.....	.....	3	.....	.....	.....	3	.....	.....	6
Beechcraft 18 8,750	25	11	87	11	7	6	2	.....	5	154
Lockheed 12 8,650	.....	.....	3	.....	.....	1	.....	.....	.....	4
Grumman G–21 8,000	1	2	.....	1	.....	.....	.....	7	.....	11
Cessna UC–78—T–50 5,700	71	24	231	87	35	39	23	4	8	522
Grumman G–44 4,225	20	5	25	1	.....	2	.....	2	1	56
Total Multi-Engine Aircraft	229	177	401	105	56	183	60	46	23	1,280
Single Engine Aircraft	1,139	707	1,447	788	622	226	385	161	1	5,476
Helicopter	2	2	8	.....	3	1	.....	.....	.....	16
TOTAL AIRCRAFT	**1,370**	**886**	**1,856**	**893**	**681**	**410**	**445**	**207**	**24**	**6,772**

Source: Civil Aeronautics Administration.

CIVIL AERONAUTICS BOARD



Mobilization

Wartime use of transports is blueprinted by topside defense planners.

U. S. defense planners are working at top speed to draw up a blueprint for complete mobilization of U. S. commercial air transportation facilities in wartime.

Basic differences between military and commercial interests must be ironed out before final plans can be prepared. But the Air Coordinating Committee "shortly" expects to forward to the National Security Resources Board a statement of general policies preliminary to the formulation of a detailed and comprehensive airline mobilization program.

▶ **Advisory Panel Active**—The Air Coordinating Committee's membership includes representatives from the Air Force, Navy, State Department, Civil Aeronautics Board, Department of Commerce, Post Office and Treasury Departments and the Bureau of the Budget (non-voting). An industry advisory panel, which makes recommendations to ACC, consists of the Air Transport Assn., Aeronautical Training Society, Air Freight Assn., Air Freight Forwarders Assn., Aircraft Industries Assn., Aircraft Owners & Pilots Assn., Institute of Aeronautical Sciences, Aviation Section of the National Education Assn., National Aeronautic Assn., National Aviation Trades Assn., and the AFL and CIO.

ACC's general policy statement on mobilization will reflect the views of civil agencies, the military services and the air transport industry, including certificated and uncertificated carriers. It will cover the allocation of commercial transport aircraft, pilots and facilities to the military and essential civilian services in the event of war. A system of priorities to be used in connection with transportation of passengers, mail and cargo will be discussed together with measures—including proposed governmental machinery—necessary for the most efficient operation of a wartime airlift.

▶ **Prototype Studies**—A Civil Transport Aircraft Evaluation and Development Board, which was created provisionally within ACC's framework, has made preliminary studies of the problems involved in governmental assistance for the development of prototype transport aircraft. Including among these studies have been surveys of air cargo potential, characteristics of possible prototypes, and methods by which the government might recover money spent on prototype development.

The National Security Resources

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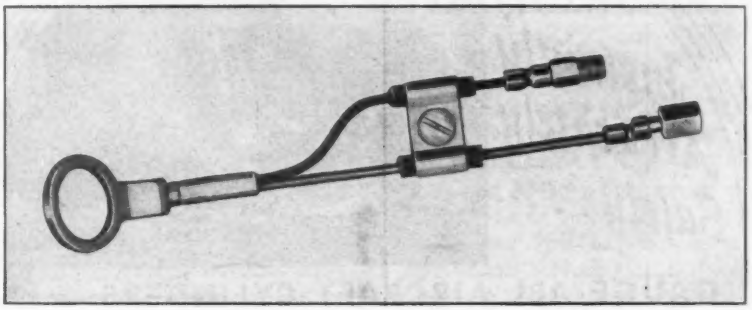

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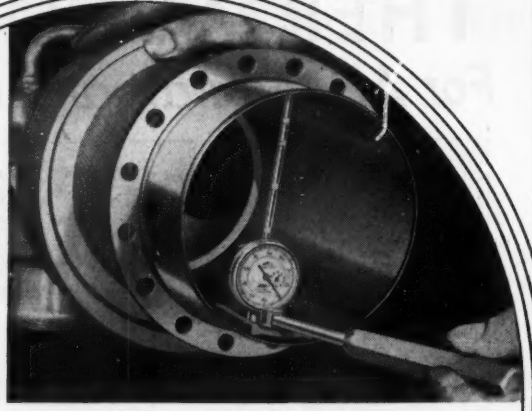

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Board, which will evaluate ACC's report, is the agency which advises the President on coordination of all phases of military, industrial and civil mobilization.

▶ **Military Point of View**—The armed services make no bones about their desire to take over the great bulk of commercial airlift if war comes. Their view is best summed up by the Military Air Transport Service which states: "From a study of the over-all question of military versus contract carrier operations, considering not only military requirements but also cost and utilization factors, it appears that military operations are preferable as providing maximum military effectiveness of air transport resources."

A comprehensive government program of mobilizing air transport resources was not available at the outbreak of World War II. But the carriers were quick to implement plans which had been prepared by the Air Transport Assn.

▶ **World War II Record**—Six months after the start of World War II, 193 of the 359 transports operated by the certificated airlines had been turned over to the government.

In addition, from 1942 through 1945, commercial carriers flew 421,000,000 plane miles and 1,055,000,000 ton miles under contract for the Air Transport Command and the Naval Air Transport Service. During 1942, the first year of the war, 97.5 percent of all ton miles flown by ATC and NATS was accounted for by the commercial airlines' contract operations.

▶ **Large Transports Eyed**—MATS proposes to take over practically all the "strategic" transport aircraft of the commercial airlines—with emphasis on four-engine equipment. "Practically all foreign routes from the U. S. will be of direct strategical importance during wartime, with the possible exception of links to Canada, South America and Central and South Africa via the South Atlantic," according to MATS.

"Maintenance of these few international commercial routes by U. S. civil carriers should require only a relatively small quantity of strategic aircraft. The domestic and foreign routes, not to combat areas, which are essential to the war effort, could be flown by the airlines with twin-engine equipment."

▶ **Maintenance Support**—MATS believes it will be impracticable for the military establishment to provide immediate maintenance support for the strategic transport aircraft acquired from civil carriers. Thus, besides furnishing planes and crews, the civil airlines could contribute importantly to the war effort by making available their existing maintenance and overhaul shops, equipment and personnel.

Helicopter's Air Power Role Misunderstood

Although rotorcraft has proved its tremendous utility, orthodox air thinking has not grasped its potentials.

By L. Welch Pogue*

The postwar history of the helicopter has been one of aviation's more puzzling paradoxes. The helicopter has disappointed no one in its performance, utility, and safety; it has done everything ever claimed for it.

Yet there are only a few hundred in use, and the task of the manufacturer's sales department is not easy.

▶ **The Record**—Where the helicopter is today can be gauged by the record. The past year provided applied proof of its inherent ability to perform many diverse functions more quickly, more effectively, or more economically than by any other means.

For example, commercial helicopter operators in the United States and in a number of foreign countries regularly are engaged in extensive agricultural and disease-control activities. Hundreds of miles of power lines are regularly patrolled by helicopters. A number of helicopters are being used full time in petroleum and mineral prospecting.

▶ **Transport Use**—The past year also has brought clear proof of the helicopter's potential as a transportation vehicle in regular service. Los Angeles Airways has expedited more than two million pounds of airmail since it first started helicopter mail service in October of 1947. It has made 70,000 helicopter takeoffs and landings in airmail service, and the increase in airmail volume which the Los Angeles helicopter service has generated points clearly and emphatically to the helicopter's potential in removing one of the most serious and longstanding deterrents to air transport—the time-consuming surface travel between airport and destination.

The time saved in hauling mail by helicopter and the favorable public reception which helimail service has met, show plainly that here is the vehicle which is the missing link in our air transport network.

Our present airline passenger network was preceded by aircraft which carried mail alone. The helicopter is only following this natural progression.

▶ **Service Use**—The helicopter is one of the few vehicles that is useful to every branch of our Armed Services. Air Force, Army, Navy, Marines and Coast Guard all have vital functions that already are being performed best by helicopter. Its invaluable abilities and accomplishments as a rescue vehicle have become so familiar as to almost be taken for granted.

Less familiar are the many tactical and transport uses for the helicopter in military operations. For example, the Coast Guard, in the winter and spring of 1948, succeeded in opening the Great Lakes to shipping several weeks earlier than ever before, through the use of a helicopter-ice breaker team.

The Marines, using the largest transport helicopters in production today, already are engaged in the development of techniques for ship-to-shore landing of assault troops and equipment. The helicopter alone can relieve the necessity for costly beach landings, enabling assault forces to make their initial landings with full equipment on more defensible inland spots.

While the potential military applications for the helicopter are so numerous and so interesting as to preclude coverage here, I have mentioned those two uses because it has become apparent that some segments of our military leadership are not fully aware of the fact that the helicopter, while certainly not a weapon, is one of the most useful and vital military vehicles.

▶ **Wrong Perspective**—Among all of the large number of uses to which the helicopter is peculiarly adaptable, perhaps the one that has received the most attention by the military is that of rescue work. In fact, it may be that the perspective of officials is so concentrated on the rescue function of the helicopter as to have diverted their attention from a multitude of other uses. But even in the rescue field, only a small start has been made.

Civilian agencies are showing a remarkable interest in a wide use of this versatile machine. The CAB and the CAA have shown a most progressive attitude in adjusting regulations to give this new vehicle a chance.

▶ **Other Government Use**—The Department of the Interior has used helicopters under contract for mapping operations in the more mountainous areas in the United States and in Alaska and has adopted it as a regular vehicle for mapping work. The Tennessee Valley Authority, Coast and Geodetic Survey, the Forest Service, and the New York Police Department are helicopter users.

▶ **Why Not More?**—This again poses that ever-present question as to why the helicopter still has not appeared in quantities. I feel this is in large part because the helicopter has the unusual position of being an aviation vehicle whose major applications lie in non-aviation fields—or in applications not yet encompassed by air thinking.

Its transport potential is that of rapid inter- and intra-urban service, providing a type of air service that cannot be performed by any other means. Full development of the helicopter's transport potential thus must await the expansion of present air transport official thinking.

Similarly, the non-transportation services of the helicopter are in practically all instances rendered to users not familiar with aviation and naturally skeptical of the ability of a flying machine to perform industrial and agricultural tasks for which the fixed-wing airplane, the standard of most initial thinking, is not suitable.

▶ **Military Problem**—This paradox of an aviation vehicle whose most valuable applications lie beyond the scope of present aviation thinking, presents a greatly amplified problem with respect to our Armed Services.

We naturally expect timely helicopter development and procurement by the services.

Yet, the personnel in these segments must operate in an environment and a state of mind that is by no means conducive to full perspective of the helicopter's potential. Officers must concern themselves with the complexities of jet propulsion, atomic power and weapons, and a basic concept that is keyed primarily toward speed and destructive power (as it most certainly should be). Therefore, it is difficult to mesh full appreciation and application of an entirely different vehicle, the helicopter, into the gearing of military air thinking. This challenge can be met only by education, performance, and time.

The helicopter has established itself. When the government takes an interest in its further development and use comparable to that shown in fixed-wing aircraft, the full potential of the helicopter can then be realized. How long—not if—is the question now.

* Member of firm, Pogue & Neal, Attorneys, Counsel to the Helicopter Council, Aircraft Industries Assn.

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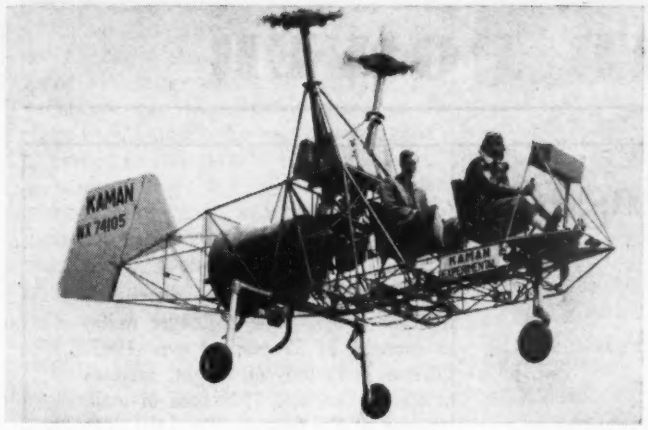
Manufacturer	Designation	No. Places	Power Plant: Make of Engine Model No.	Power Plant: Normal Rated hp.	Power Plant: At rpm.	Power Plant: At altitude, ft.	Performance: High speed, mph.	Performance: At altitude, ft.	Performance: Cruising speed, mph.	Performance: At altitude, ft.	Performance: S.L. climb at gross weight, rpm.	Performance: Hovering ceiling, ft.[1]	Performance: Absolute ceiling, ft.	Performance: Normal range, mi.	Gross weight, lb.	Empty weight, lb.	Main rotor: No. rotors	Main rotor: Blades per rotor	Main rotor: Diameter	Main rotor: Rotor rpm., cruising	Anti-torque rotor: No. blades	Anti-torque rotor: Diameter	Anti-torque rotor: Rotor rpm., cruising	Fuselage: Length	Fuselage: Height to top of main rotor	No. Built	Price
American Helicopter Co. 3613 Aviation Boulevard Manhattan Beach, Calif.	XA-5	...	2 Pulsejet	65	....	....	75[2]	....	65[2]	....	....	.....	.....	...	1200	940	1	2	33'	180	No	.....	....	20' 6"	7' 8"	....	.....
Bell Aircraft Corp. P.O. Box 1 Buffalo 5, N.Y.	47D	2	A,6V4-178-B-32	178	3000	S.L.	92	S.L.	85	S.L.	1025	.....	.....	212	2300	1482	1	2	35' 1½"	330	2	5' 9"	1800	30' 5"	8' 4½"	....	$39,500
	47D1	3	A,6V4-178-B-32	178	3000	S.L.	92	S.L.	85	S.L.	1025	.....	.....	200	2200	1390	1	2	35' 1½"	330	2	5' 9"	1800	30' 5"	8' 4½"	....	$23,500
	48 (YH-12)	5	P&W, R-1340	550	....	....	105	S.L.	...	....	....	.....	.....	...	5685	....	1	2	47' 6"	...	2	8' 9"	1406	39' 8"	11' 6"	2	.....
	XH-15	2	C,XO-470-9	...	....	....	100+	S.L.	...	....	....	.....	20,000	100[3]	2700	....	1	2	36' 10"	...	2	6' 4"	1660	43' 9"	9' 1"	3	.....
Dunan Helicopter Corp. Danbury, Conn.	LZ-1A	2	A,405-9	240	3100	S.L.	110	S.L.	85	S.L.	900	1500	14,000	400	3000	2200	1	4	40'	225	3	8'	920	33' 11"	11'	1	.....
Helicopters, Inc. East Main Street P. O. Box 95 Stratford, Conn.	J	5-6	P&W B4	450	2300	2300	100+	S.L.	89	S.L.	1460	7000	22,000	389	5400	3600	2 co	2	4' 8"	2300	..	....	....	18' 6"	14' 10"	1	.....
Helicopter Engineering Res. Corp. Boulevard Airport Philadelphia 14, Pa.	JOV-3	2	L,O-290-A	125	2500	S.L.	100	S.L.	73	S.L.	1290	.....	14,000	138	1340	870	2 ta	3	18' 6"	500	..	....	....	16' 8"	9' 3"	1	$11,800
Jensen Helicopter Co. Tonasket, Wash.	21	2	C,C-125	125	2550	S.L.	100	1000	82	1000	1000	3000	10,500	200	1550	1050	2 co	2	27'	....	..	....	....	13' 7"	9' 9"	1	.....
Kaman Aircraft Corp. Bradley Field Windsor Locks, Conn.	K-190	3	L,O-435	190	2550	S.L.	...	....	...	....	....	.....	.....	...	2500	....	2 int	2	38'	....	..	....	...	22' 6"	11' 1"	....	.....
McDonnell Aircraft Corp. Lambert-St. Louis Airport St. Louis, Mo.	Little Henry	1-2	2 Ramjet	...	....	....	50+	S.L.	...	....	....	.....	.....	...	630	280	1	2	18'	640	..	....	....	12' 6"	7'	2	.....
Penn Elastic Co. 20 Maplewood Avenue Philadelphia 44, Pa.	B1	2	Aircooled	150	2575	S.L.	...	....	...	....	....	.....	.....	...	1300	700	2 co	3	29' 6"	320	..	....	....	18'	7' 9"	1	.....
Piasecki Helicopter Corp. Morton, Pa.	PV-3 (HRP-1) PV-15 (XH-16)	10 40	P & W R-1340	500		2500	120	2500	85	S.L.	800	4000	12,000	300	6900	5000	2 ta 2 ta	3	41'	...	..	....	....	48'	12' 6"	20	.....
Rotor-Craft Corp. Grand Central Airport Glendale 1, Calif.	X-2 (XR-11)	2	L,O-235[4]	120	2600	S.L.	110	S.L.	95	S.L.	1100	5000	14,000	100	1400	900	2 ta	3	18'	420	..	.....	....	14'	8' 6"	1	.....
Seibel Helicopter Co. Route 3 Wichita, Kans.	S-4	2	L,O-235	108	2600	S.L.	100	S.L.	80	S.L.	1000	11,000[5]	.....	230	1550	900	1	2	29'	390	2	5' 6"	1525	.....	.....	1	$10,000
Sikorsky Aircraft Div. United Aircraft Corp. Bridgeport 1, Conn.	S-51 (H5G) (H03S-1)	4	P & W B4	450	2300	2300	103	S.L.	85	S.L.	1000	3500	14,100	255	5300	1505	1	3	48'	194	3	8' 5"	1278	41' 2"	12' 11"	150[6]	$80,000[6]
	S-52	2	A,6V4-165-B32F	165	3275	S.L.	94	S.L.	80	S.L.	800	1100	12,000	250	2100	1392	1	3	33'	300	2	5' 3"	2090	26' 7.5"	8' 4"	2	.....
	S-52-1	2	A,6V4-245-B16F	245	3275	S.L.	113	S.L.	92	S.L.	1400	5900	17,000	450	2300[6]	1550	1	3	33'	300	2	5' 4"	2090	26' 7.5"	8' 4"	1	.....
United Helicopters, Inc. 625 El Camino Real Palo Alto, Calif.	Hiller-360	3	A,6V4-178-B33	178	3000	S.L.	84	S.L.	80	S.L.	625	5200	10,000+	200	2247	1447	1	2	35'	320	2	5' 6"	1800	26' 8"	9' 6"	14	$19,995

*approximate; 1 without ground effect; 2 calculated; 3 Bell XH-15 combat radius; 4 modified; 5 with supercharger; 6 overload permissable to 2700 lb.

A--Aircooled Motors; C--Continental; co--coaxial counter-rotating; int--lateral intermeshing; L--Lycoming; P & W--Pratt & Whitney; S.L.--sea level; ta--tandem.



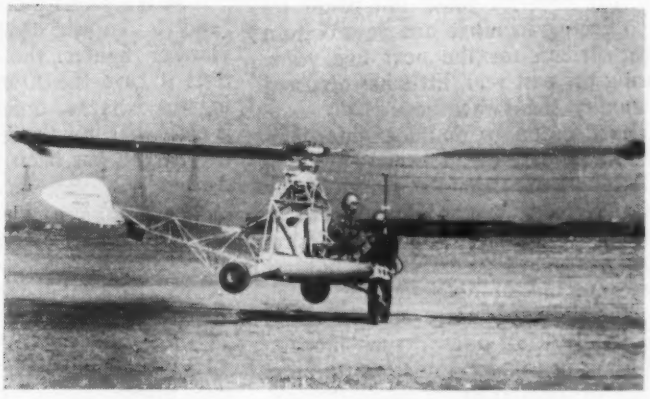
Kaman K-190

Hiller 360

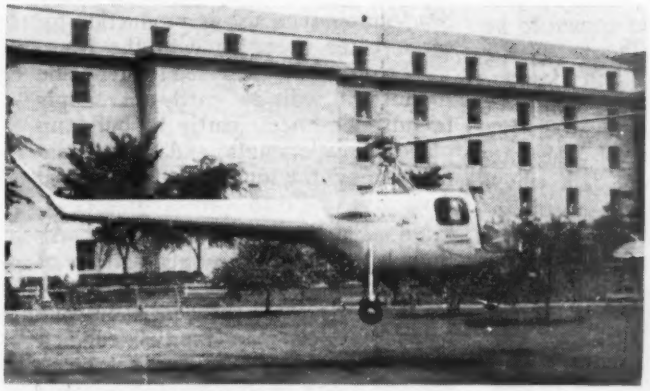
Sikorsky XHJS-1

Piasecki HRP-1

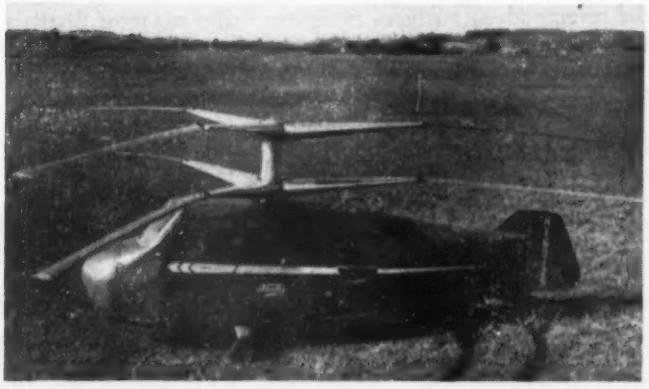
Bell XH-15



American Helicopter XA-5



Sikorsky S-52



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Civil Air Power:

No. of aircraft produced (excluding military types) for first 11 months of 1948 totalled 401. Total for 1947 was 751. 1946 total was 644.

Export	1948	1947	Value 1948	Value 1947
Complete aircraft....	1095	1720	£13,425,764	£13,724,143
Aircraft engines.....	1345	1630	£3,207,524	£4,040,431

Royal Air Force:

Total strength (including WAAF) on Mar. 31, 1948:.....263,000
Total strength (including WAAF) on Jan. 1, 1949:.....237,000 (est.)
Regular RAF officers and airmen on Jan. 1, 1949:.....112,000
National Service men on Jan. 1, 1949:.....111,000
Women (regular and National Service) on Jan. 1, 1949:..... 14,000

The Airlines:

BOAC—Flew 119,343 passengers, total of 366,500,000 passenger miles, an increase of 22 percent over 1947. Carried 3166 tons of freight, increase of 68 percent, and 1720 tons of mail, increase of 8.6 percent.

BEA—Flew 150,640,629 passenger miles, increase over 1947 of about one-third.

BSAA—Flew 17,510 passengers, 46,242,499 passenger miles, slightly less than 10 percent increase over 1947.

Britain Is Still a Second-Class Air Power

National policy is against putting into production latest fighter types, while RAF is small, but well trained.

By Frederick R. Brewster

LONDON—A year ago the conclusion of well-informed observers here was that America could not count on any effective combat air power from Great Britain for the next five years. During the past year, little has occurred to modify this conclusion.

The decision to double fighter production as part of an overall program to strengthen Britain's air defenses, was announced by the Government in September when the international situation was most tense. It has not yet been reflected in deliveries (of which no official figures are ever released in this country) but only in such preparatory steps as the accumulation of larger stocks of components, materials, etc. for the early stages of construction.

► **No Hurry**—And Britain still isn't inclined to hurry into quantity production of the several advanced types of fighter planes that have been developed since the war. Only very late in 1948 did the Admiralty finally give the go-ahead sign to Vickers-Armstrongs' Supermarine division to start rolling on the folding-wing naval-version of the Attacker. Yet this Nene-powered jet fighter dominated the first postwar S.B.A.C. show at Radlett in September, 1946.

No production order has yet been placed (which means that none is likely to be forthcoming) for the Hawker N7/46, a cleaner-lined jet fighter also powered by a single Nene, and also developed for the Navy, which flew just a year later, in September, 1947. Yet the Hawker job looks to be capable of at least 50 mph. better than the Attacker.

The Navy had plenty of time to give (and is known to have given) the Hawker fighter the same exhaustive tests it gave the Attacker, before placing the Attacker order. The inference is clear that, for the time being at least, the N7/46 has been passed up by the Admiralty.

The RAF, too, is in no lather to get cracking with its new combat planes. The novel jet-powered flying-boat fighter, the Saunders-Roe SR.A/1, looked too heavy to handle, in spite of all the power put into it (two Metro-Vick axial-flow Beryls) and was therefore turned down. Gloster's straight-winged single-jet E.1/44, likewise, wasn't good enough.

Apparently, the RAF wants to wait and see more of the types known to be coming along, such as the sweptwing single-jet jobs by Gloster and Hawker, both of which have been flying for several months, and possibly even the sweptwing modification of the Attacker, known as the Type 510, which has just made its first flight. And, apparently, they feel they can risk another year's delay before plumping for one type.

► **RAF Prospects**—No increase in the present strength of RAF's Fighter Command is in prospect, as might at first be suspected from the decision to double fighter-plane production. Instead, existing RAF squadrons in home territory will be converted to jet-powered clipped-wing Meteor IVs (with the exception of one Vampire squadron), which is a clear recognition of the special fitness of this type for high-level interception in defending the homeland from daytime bomber-intrusions. Limited endurance and range still render the Meteor unsatisfactory for night-interceptor operations, as was clearly evident in last September's large-scale air-defense exercises.

Lack of an efficient night-fighter is a glaring deficiency of the RAF as it stands. Nothing is in sight yet to replace the versatile Mosquito.

► **Vampire Use**—The de Havilland Vampire, the other standard RAF jet-fighter, being extremely nimble in the air, is especially adapted for low-level operations as an attack plane, for use in ground-support strafing, light-bombing, etc. Modified versions of this type are being completed for this particular purpose, and the bulk of them will be sent to RAF squadrons in advanced areas. Sea Vampires are also in production for carrier-based operation with the Navy.

The rest of the increased fighter-plane production will go partly to supply friendly air forces, partly to build up plane reserve strength, and the remainder to equip the squadrons of the Royal Auxiliary Air Force.

► **No High Speed Bombers Yet**—Although the prototype of at least one of the three high-speed jet-engined bombers under development here should be ready to fly very soon—the twin-engined medium-range 500-mph. project being brought along by the English Electric Co.—the British still have no successor

to the Lincoln in production and have a long way to go before they can mount an effective striking force with the speed and range called for today.

Reason for the British position is clear: they haven't the manpower or the resources to maintain a large air power in being. They're gambling on a few more years of peace, in which to rebuild their domestic economy first, meantime maintaining a small, well-trained RAF as a nucleus—a hardcore, around which they could rapidly expand in time of emergency.

This isn't the place to discuss whether that gamble is good strategy—there just isn't any alternative for the British, these days.

▶ **Expenditures Down**—The foregoing will explain, therefore, why expenditures for aircraft during the past year were again lower than the previous year, although there was not so marked a drop as from 1946 to 1947, when they were halved. Compared to a total expenditure by the RAF of £42,750,000 for aircraft, engines, and spares in the year ended Mar. 31, 1948, the RAF this year spent £38,730,000. Of this £23,460,000 went for aircraft and repairs to airframes, £8,570,000 for propellers, gun turrets and aircraft spares, and £6,700,000 for aero engines.

Numerically the RAF continued to shrink during the past year, mainly as a consequence of the expiration of terms of service of National Service men. From an officially-estimated total strength (including WAAF) on Mar. 31, 1948, of 263,000, it dwindled to an estimated 237,000 on Jan. 1, 1949. A further 26,290 discharges are called for in the three-months' period up to Mar. 31, 1949, now that the program of releases suspended temporarily in September for three months has been resumed.

▶ **Regulars Increase**—An encouraging sign is that the number of regular officers and men has grown while the total strength has been declining. From 94,510 regular RAF officers and airmen (excluding WAAF) on Oct. 1, 1947, the force has grown to an estimated 112,000 regulars on Jan. 1, 1949. Number of National Service men has decreased from 193,190 to only 111,000. Over the same period, the number of women (both regulars and National Service) has diminished from 20,100 to 14,000.

Recruiting showed a spurt during the last three months of the year, after being steadily on the decline during each of the four quarters of 1947 and the first three quarters of 1948.

In part, at least, the RAF thinks this is due to the improved pay and allowances introduced in the fall recruiting period. In brief, these give somewhat higher basic rates of pay for enlisted men, and higher allowances to married

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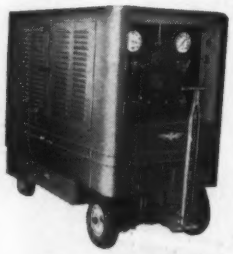
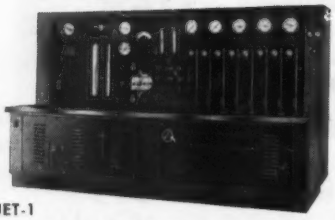
Perhaps your answer lies below. If not, pick up that pen or better yet, pick up your phone—we'll be pleased to hear from you.



PE3C-20V
Portable Field Test Machine for Hydraulic Systems



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men and officers. These are still hardly enough to lure any large number of young men away from the attractions of civilian employment, now running at an all-time high. British wage-levels are double or more those that existed before the war.

In the main, this improved response is due to increased pressure that was put behind the recruiting drive.

Tenor of this drive is that the RAF needs at least 100,000 new regulars over the next two years to raise its regular strength to about 180,000 men and women. This means new enlistments at the rate of 1000 a week, which the drive to date certainly hasn't yet begun to produce. However, this must certainly be the soundest basis for the future RAF, even though nearly half of the men called up for compulsory National Service are choosing the RAF as their preference of the branches in which to serve.

▶ **Builders Idle**—Waiting for military contracts to start flowing again, British plane and engine-builders are being kept alive (but barely) by their export business and (in a few cases) their successful civil transport efforts.

Total production of planes (excluding military types) for the first 11 months of 1948 was only 401, compared to 751 in all of 1947 and 644 in 1946. Exports for the full year 1948 included 281 new planes (including military types) and conversions and sales of ex-military types which brought the total to 1095 planes, worth £13,425,764. This compared to the preceding year's exports of 270 new planes and total exports of 1720 aircraft worth £13,724,143.

Aero engine exports in 1948, 1345 units worth £3,207,524, were down slightly from 1947, when 1630 engines worth £4,040,431 went abroad.

▶ **Airlines Gain**—All three of the scheduled airlines made new gains during 1948. British Overseas Airways Corp., largest of the three, flew 119,343 passengers, a total of 366,500,000 passenger-miles, an increase of 22 percent over 1947. The Corporation also carried 3166 tons of freight an increase of 68 percent, and 1720 tons of mail, an increase of 8.6 percent. Route miles in operation at the end of the year totalled 150,000.

British European Airways flew 150,640,629 passenger-miles in 1948, an increase over 1947 of approximately one third. Freight (3642 metric tons) and mail (2314 metric tons) were nearly double the previous year. Total aircraft-miles flown were 12,345,309, achieved with slightly fewer planes.

British South American Airways flew 17,510 passengers, a total of 46,242,499 passenger-miles in 1948, compared with 42,068,779 passenger-miles in 1947 or slightly less than 10 percent increase and carried 753 tons of mail and freight compared with 646 tons in 1947. The carrier flew 5,173,478 aircraft-miles, an increase of 26 percent and its route-miles as of Dec. 31 were 21,011 compared with 20,119 the year previous.

Brazil: Aviation Opens Country

By Henry W. Bagley

RIO DE JANEIRO—Civil aviation pushed the development of Brazil's vast hinterland in 1948 and helped strengthen the country as an ally in any future emergency.

With nine regularly scheduled lines and several nonscheduled carriers operating, Brazil now has flying fields scattered almost from one end of the country to the other.

Seven foreign companies also are running regularly to and from Brazil: Pan American, British South American, Air France, Scandinavian, KLM, FAMA (Argentine) and Iberia (Spanish).

▶ **Airports**—In many cases, domestic airlines have built the airfields or contributed substantially to their development. More airports are going in steadily. One chain of projected fields will make two-engine plane landings possible at several points between the country's developing central region and the Amazon's mouth.

Brazil has moved from the horse-and-buggy era to the air age without more than elementary development of roads and railroads. In some interior towns with airfields, the only overland link with the outside world is by river or animal trails.

Only seven airfields, however, are large enough for four-engined craft, and only nine are equipped for night flying.

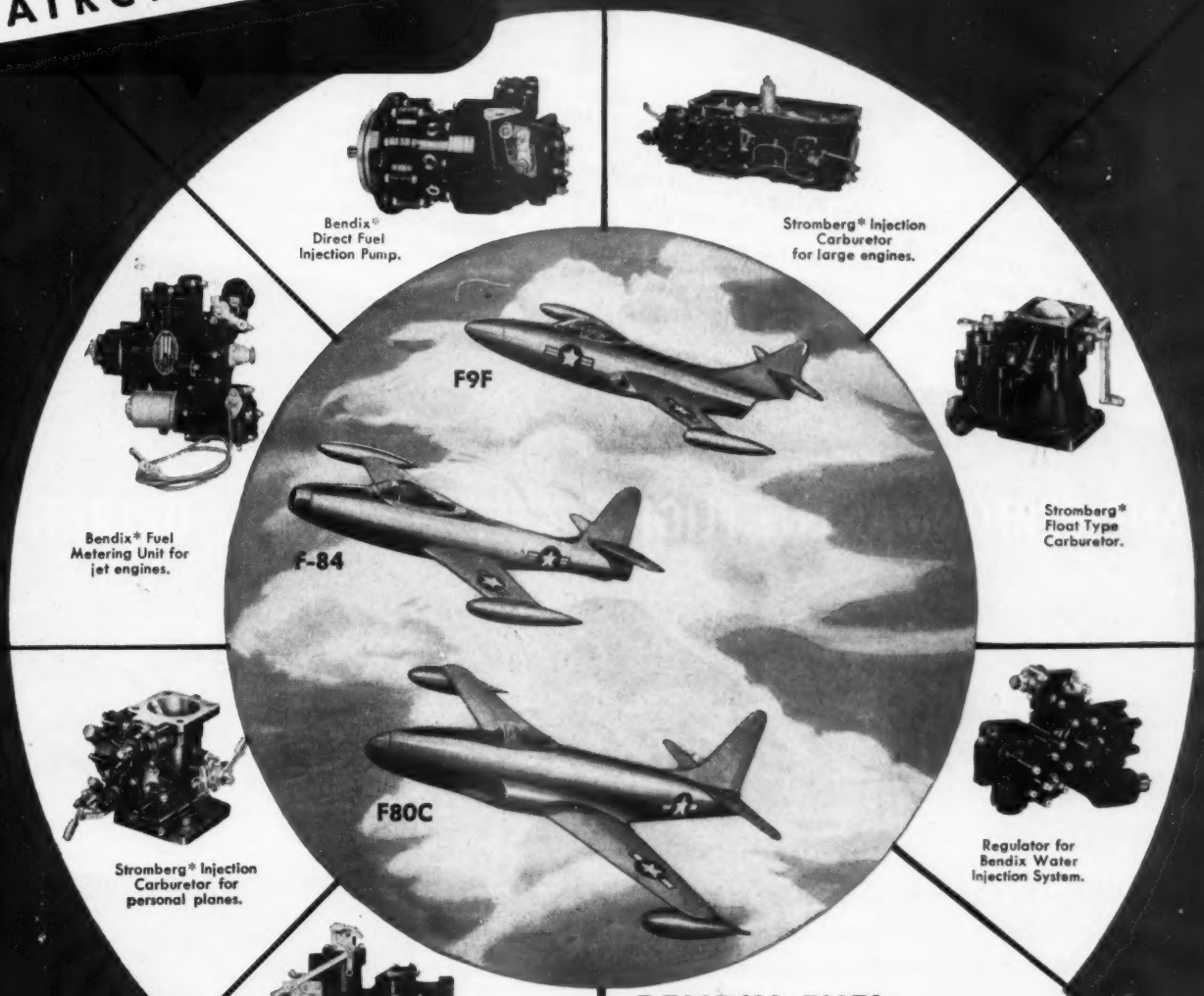
▶ **Budget**—The federal budget for 1949 allotted nearly $75 million for the air ministry, under whose wings come all military and naval aviation. This is an increase of about $10 million over 1948.

The air force, small by North American standards but sharing with Argentina the top spot in South America, uses American equipment. Pilots who flew in a Brazilian fighter squadron on the Italian front, and others who maintained a South Atlantic patrol, give the air force more experience than others in South America.

National civil aviation companies flew about 182,000 hours in 1947, carrying 770,000 passengers and about 23,000 tons of freight and baggage. Figures for 1948 are not available.

Bendix Products

AIRCRAFT FUEL METERING SYSTEMS



Bendix* Direct Fuel Injection Pump.

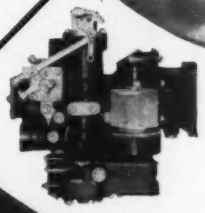
Stromberg* Injection Carburetor for large engines.

Bendix* Fuel Metering Unit for jet engines.

Stromberg* Float Type Carburetor.

Stromberg* Injection Carburetor for personal planes.

Regulator for Bendix Water Injection System.



Bendix* Speed-Density Fuel Metering Unit.

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Dependable: A record of dependability beyond all expectations—comparable to that of other Bendix Fuel Metering Equipment over the years.

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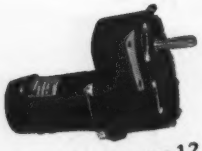
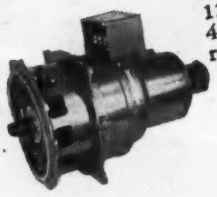
AIRCRAFT MOTORS AND GENERATORS

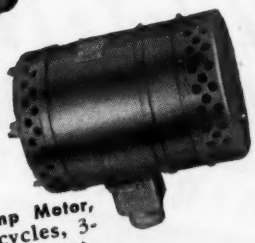


Wing Flap Actuator, 12 v, d-c—1/50 hp interm., 10 rpm.

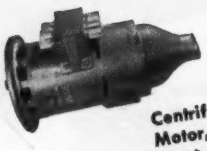


Constant-Frequency Alternator, 40 kva, 120/208 v, .75 P.F., 400 cycles, 6,000 rpm.

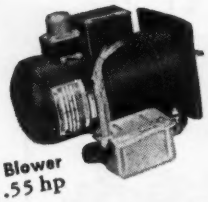
Variable Speed, D-C Generator, 30 v, 9 kw, 30 v, d-c, 300 amps, 3,000/9,000 rpm.



Hydraulic Pump Motor, 208 v, 400 cycles, 3-phase, 7.5 hp cont., 11,500 rpm.



Constant-Speed, D-C Generator, 24 kw, 30 v, d-c, 800 amps, 6,000 rpm.



Centrifugal-Type Blower Motor, 27 v, d-c, .55 hp cont., 7,500 rpm.

There's a drive for every flying job—and a generator to supply the power—in the complete line of Westinghouse motors and generators. Built to exacting specifications—and tested under actual flight conditions—these units give you the proper combination of dependable performance and minimum weight. The units pictured are just a few to indicate the range of application, the speeds, frequencies and power available in both motors and generators.

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For more information, call your nearest Westinghouse office or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

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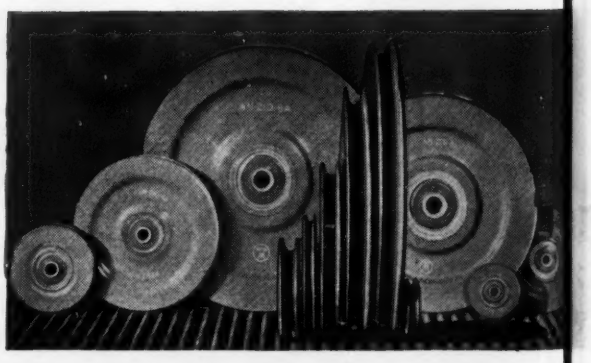

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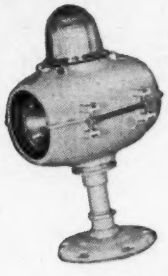
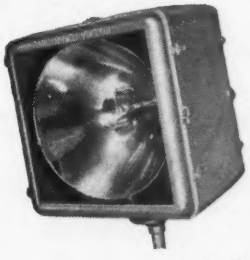
ALL-WEATHER AIRPORT LIGHTING

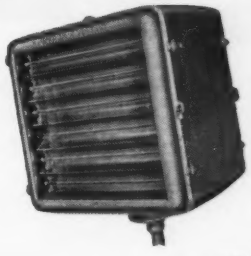
Here's another Westinghouse development designed to remove the hazards imposed on aircraft by "ceiling zero" conditions. This approach lighting system is visible through 1,000 feet of the thickest weather—when objects 50 feet away cannot be seen. It's the long-awaited landing aid that takes up where radio direction ends. Its principal units are shown below.



High-intensity Runway Light . . . a new light designed to provide better runway indication under any visibility condition. It contains 3 separate light sources, one medium-intensity and two high-intensity, independently controlled, with ten steps of brightness.

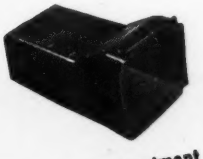


Flash Unit . . . employs a Krypton lamp having a maximum brightness of over 9 million candlepower per square inch. This is magnified by the optical system to give the unit a candlepower range of 1,000,000 to over 3,000,000,000.



Blaze Unit . . . contains 6 straight, stroboscopic-type tubes with an effective length of about 2 feet. Steady burning brightnesses range from 100 to 10,000 candlepower and flashing brightnesses from 100,000 to 10,000,000 candlepower.

MICARTA "444"



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Pilot's Console

This tough, versatile laminate offers you the opportunity to increase aircraft payloads with stronger, lightweight parts. Production of Micarta parts is simple, fast and economical because it can be formed easily into intricate shapes with inexpensive equipment. It is resistant to heat, cold, humidity and chemicals and can be easily machined with ordinary tools. It is only half the weight of aluminum, yet nearly its equal in compressive strength. Above are a few aircraft applications.

Micarta Aircraft Pulleys

A natural for aircraft duty, Micarta pulleys provide real dependability in the vital function of cable control. Their use on all types of aircraft has long been approved by the Army, Navy and CAA. Lightweight and tough, Micarta pulleys cause practically no wear on the cable, with a minimum of wear on themselves, thus assuring long life for both cable and pulley. They are available in a wide range of standardized sizes for every type of cable control from engine to rudder.

Battery Chargers

Rectox mobile battery chargers are available for outdoor use on 115/230-volt circuits for charging 6 or 12-cell airplane batteries. The units are self-regulating and self-protecting. Adjustment of charging rate is simple.

Engine Starters

Completely self-contained in a weatherproof steel cabinet, the Rectox engine starter is wheel-mounted for easy portability. It delivers full output voltage instantaneously and maintains high efficiency over a wide load range.

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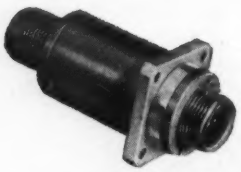
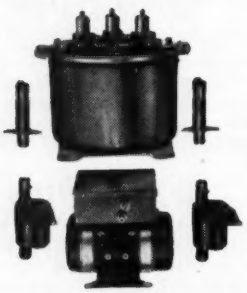
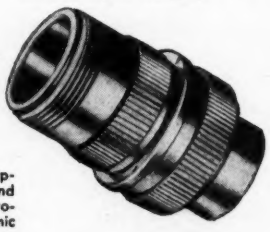


Bendix-Scintilla* Radio Interference Filters are designed for insertion in aircraft ignition grounding circuits. Extremely successful in eliminating radio noise at very high frequencies.



Bendix-Scintilla* Ignition Equipment is made in low tension and high tension types for reciprocating engines, and electronic systems for jet and turbine engines.

Bendix-Scintilla* Electrical Connectors are built in a wide variety of sizes and types — precision-designed to give a pressure-tight, water-tight and radio-quiet assembly.



More progress in military aviation has been achieved in this country than in any other on earth. Suppliers of functional components for military aircraft either develop with the changing picture or fail. The Scintilla Magneto Division, as foremost producer of ignition equipment for military, commercial and personal aircraft, attributes much of its own growth and achievement to the basic incentive of keeping America first in the air.

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Bendix AVIATION CORPORATION

France Gives Up Hope Of Balanced Air Power

Manpower and production to be scaled down; jet work to continue.

By Boyd France

PARIS—The French aviation industry has pulled out of its long tailspin—and gone into a power dive. Both quantity and diversity of production will be cut back drastically in the first quarter of 1949.

About 17 factories are slated to be shut down completely. Others will scale down production schedules. The industry's manpower pool will be drained 50 percent to an approximate level of 30,000.

▶ **No Balance**—At the same time France will give up attempts to support a balanced air industry and will concentrate on light and medium sized ships. Both military and civilian aircraft over about the 70-ton limit will be scratched off future production schedules.

Some jet research will be continued. But most of the French Air Force's jets are expected to be foreign types manufactured in France under franchise. The French government has been dickering for months with the British for the right to make Vampires. There are hints that it also is eyeing some U. S. jets.

The French Air Force and commercial aviation will reflect this scheduled cutback of industry. The Air Force already has liquidated its bomber squadrons, for example. Air France will have to continue importing its long range planes.

It was inevitable that French aviation should take a nose-dive.

▶ **Planning**—France tried too hard planning its postwar aviation program. Air power symbolized regained national security and pride to the defeated and humiliated French. They determined to have a big modern air force and aviation industry regardless of whether or not France could afford it.

The labor force of the aviation industry consequently mushroomed to over 100,000 from 40,000, between 1944 and 1946. During the same period U. S. and British air industries were firing men wholesale.

▶ **Ten Years Behind**—The French showed the same enthusiasm in technical planning. French technicians were lagging about 10 years behind their American and British opposite number in experience. But they impatiently scorned studying or copying British or U. S. planes. Instead they went off on a wild designing spree.

No less than 20 different prototypes

French Aircraft

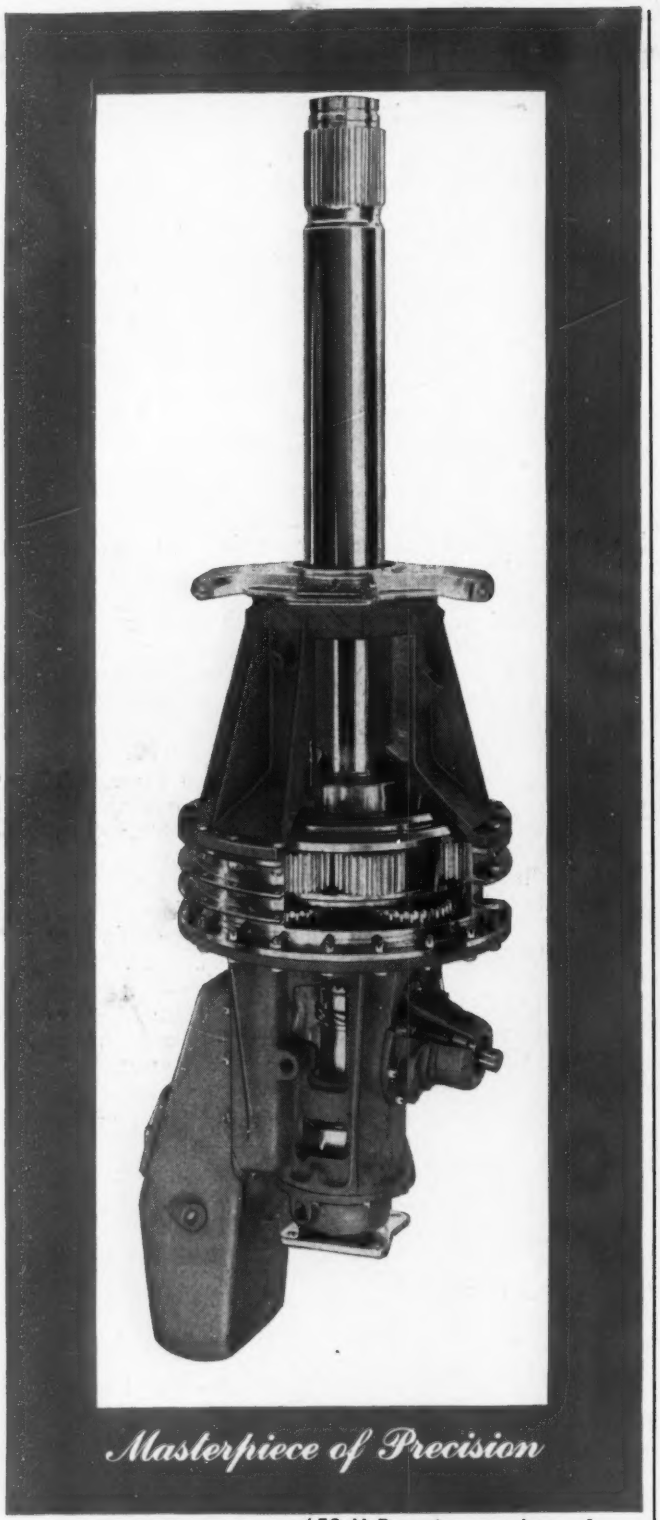
PARIS—The following list of interesting French aircraft with brief informal comments on each underlines the present difficulties of the French aviation industry:

Helicopters:

- G-11E (Breguet)—No prototype. Four in production.
- N-1700—Made one. Apparently abandoned.
- NC-2001—Made one. Rotor gearing failed and ship crashed.
- SE-3000—One has flown but details of the flight are unavailable.
- SE-3101—Experimental and research ship for advanced study. One has flown.
- SO-1100—Jet helicopter. Made two. One crashed and burned on test flight. Second is scheduled to be tested soon.

Military Aircraft:

- Leduc 010—Research plane. Landing gear failed in first test flight. Now being flight tested on back of a Languedoc.
- Messerschmitt jet—Study design. No prototype made yet.
- Nord 1600—Experimental jet. Made one which hasn't flown yet.
- N 1601—Research jet. Made one which hasn't flown yet.
- N 1830—Transport. No performance details.
- N 2200—Naval jet fighter powered by a Nene engine. Still not completed.
- NC 270—Twin jet bomber. Not finished.
- NC 271—Flying model of N270. Being tested.
- NC 1080—Naval fighter.
- SE 1800—Jet propelled flying wing project.
- SE 2400—Jet bomber project.
- SE 2410—Fighter bomber.
- SO 4000—Jet light bomber.
- SO 4000 M2—Research flying model of SO 4000. Originally designed to be powered with Derwent V's now reportedly powered with Nenes. Being tested on top of a Heinckel 274.
- SO 6000—Jet.
- SO 6010—Production version of SO 6000. Made half a dozen of them.
- SO 6020—Jet fighter. Powered Nene. Looks like SO 6000 but badly designed. Has flown once but no details available. (This SO 6000 series has received a lot of publicity; probably has less bugs in it than other French jets. But they are all conventional airplanes with no specially original or interesting features.)
- SO 8000—Carrier borne jet propelled fighter.
- SO M1—Scaled down model of SO 4000.
- VB 10—Navy fighter. Twin-engined, one front one rear. Made forced landing first test flight because of over-speeding of rear engine.
- SO 7010—Light transport.
- VG 70—Jet fighter and transonic research plane with sharply swept back wings. Crashed during test flights.
- VG 90—Single-seat naval fighter.
- Breguet 761—Cargo plane. Will be flown soon. Four are being built.
- Breguet 890J and 892S—Small transports.
- CM 10—Glider.
- CM 100—Cargo ship.
- MP 1000—Racer. Not finished.
- Nord 1400—Twin-rudder flying boat.
- Nord 1500—Torpedo dive bomber. (Rube Goldberg combination of several other planes.)
- Nord 2100—Light transport. Carries 10 passengers. Three or four made.
- NC 211—Cargo and passenger plane.
- NC 280—Light transport.
- NC 702—Short range transport.
- NC 800—Feeder line transport and mail plane.
- NC 810—Feeder line transport and mail plane.
- NC 820—Feeder line transport and mail plane.
- NC. 1070—Torpedo bomber. Gnome Rhone powered.
- NC 1071—Same as 1070 but Nene powered.
- NC 3020—Experimental high altitude ship. Laminated wood frame.
- S 70—Transport.
- SE 200—Flying boat. Two made. Only one been flown. Construction abandoned.
- SE 500—High altitude fighter. Orders cancelled.
- SE 700—Autogiro. Finished but no details. Production plans cancelled.



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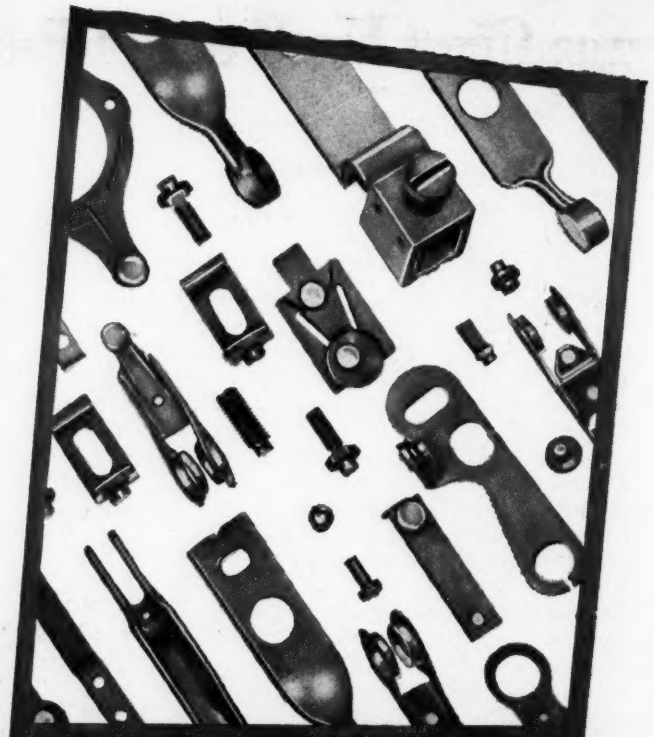

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of transport planes have been built in the last few years. They range from 160-ton giants, through supposedly globe-girdling 100 tonners, to 70-ton hydroplanes, and light twin engined ships. Total tonnage of these prototypes topped 900 metric tons. Total cost of this transport production program alone would have exceeded 100 billion francs (about $330 million.)

▶ **Combat Program Ambitions**—The combat plane production program was equally ambitious. Ten reciprocating engine prototypes and more than 15 jet prototypes have been built, totalling 350 metric tons. Cost of completing this program would have been around 95 billion francs.

Helicopter prototypes total 15. Some 50 prototypes of light liaison and sports planes have been designed. Added to a staggering bill for reconstruction of ruined factories, construction of new ones, building of wind tunnels, laboratories and testing facilities, completion of this program would have cost France many billion francs more than its already overstrained national budget could have afforded even over a period of many years.

▶ **Nationalization A Factor**—Nationalization of the bulk of the aviation industry contributed directly to this over-ambitious planning. Fat government subsidies made it possible for the industry to plan its production without any reference to either qualitative or quantitative market demand.

The fact that the state was at the same time the biggest producer of aircraft and practically the sole purchaser of aircraft led to a lot of juggling of the books and arbitrary price fixing based on political not economic considerations. It led to interminable payment delays which in an inflationary situation frequently left whose sectors of the industry completely without funds.

Nationalization also turned the industry into a political plaything. Communists seized control of it after the Liberation; purged anti-communists wholesale, regardless of professional qualifications. Communists in their turn have been largely purged in the last year or so by a series of moderate governments. Again politics, not ability, was the main yardstick used.

▶ **Subsidy Needed**—This political tug of war has seriously undermined both continuity of policy and the authority of management. But despite the evils of nationalization it is hard to see how France could support an important aviation industry without some form of subsidization in view of the extremely limited demand that has been shown for French planes.

Shortages of crucial raw materials, power, and trained technicians also have hobbled the French aviation industry, but on the whole, less than the psychological and political difficulties mentioned above.

The net result: a tragic series of prototype crashes; a thin trickle of production. The industry is in chaos. It now is practically incapable of designing correctly a single engined 900 hp. training plane; of perfecting planes which have been obsolete for ten years. Few French engines are good for more than 300 hours. It has taken painstaking effort to perfect perfectly conventional ships like the Languedoc 161, the SO 30, the Morane 472, and the SO 6000.

▶ **Cutback May Save It**—The scheduled drastic cutback of France's aviation industry is a bitter pill for proud French airmen to swallow. But it may save the industry's life. Given more modest and realizable objectives, more concentration of effort, more specialization, the French aviation industry still can play an important role.

For France has at least four natural assets as an air power:

- A great aeronautical tradition.
- Skilled technicians and workmen.
- Ample supplies of aluminum.
- The vast testing ground of the French empire.

These, plus patience and realism, could put French aviation back on its feet. But at the best the comeback will be long and difficult.

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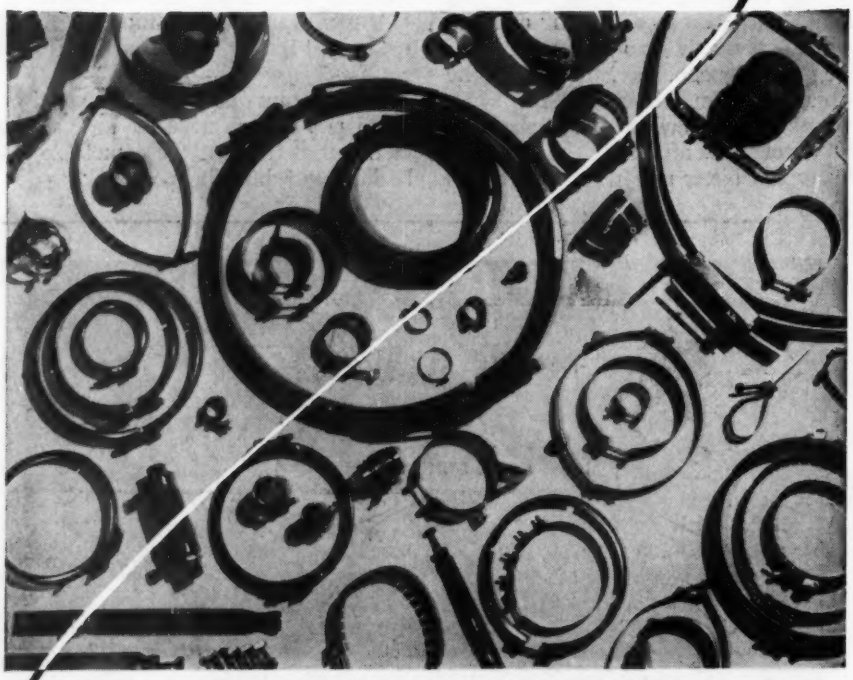

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Dutch Air Power On Upswing

AMSTERDAM—Holland's expanding military program is putting heavy emphasis on air power, partially under pressure of the western countries, union.

Actual strength of Netherlands' air force is unknown, but Harvards, Tigers, Moths, Spitfires, Oxfords, Meteors and Sea Furys are all current operational types. To date, all have been imported. But Dutch manufacturing is taking an upswing.

▶ **License Production**—Fokker, leading Dutch aircraft producer, is undertaking license production of the Gloster Meteor and the Hawker Sea Fury for the Netherlands and Belgian naval and army air forces, at its new factory near Amsterdam. Meanwhile, Holland's first operational Gloster Meteor squadron has been established.

Fokker's production is centering around these types:

• **F-25 Promotor**—A postwar-developed four-place touring aircraft, the Promotor is a single-engine pusher type low-wing monoplane. Series of 20 are nearing completion. Craft is powered by a Lycoming 0-435-A engine and has maximum speed of 140 mph.

• **S-11 Instructor**—Series of 100 of this type is under construction. Craft is a single-engine two-place trainer, powered with a Lycoming 0-435-A engine. Maximum speed is 133 mph.

• **S-12**—This craft is similar to the S-11, except it is equipped with a nose-wheel instead of the conventional type of landing gear. Prototype is complete.

• **S-13**—Prototype of this twin-engined crew trainer is being developed and should be ready by the middle of this year. Powered by two Pratt & Whitney S1H1 engines, craft will have an estimated maximum speed of 212 mph.

• **S-14**—This will be a three-place jet trainer. Prototype is under development.

▶ **Conversions** — Fokker's Amsterdam factory, and a smaller factory at Papendrecht, are converting Dakotas and Skymasters into passenger aircraft for 15 airline companies. One hundred aircraft are involved. The company, which employs 2400 persons, is doing all repair and maintenance of military and naval aircraft for the Dutch and partly for the Belgian and Swiss air forces.

▶ **Airlines**—KLM (Royal Dutch Airlines) is the Netherlands chosen carrier. It covers over 100,000 kilometers, serving 40 different countries. KLM's fleet consists of 37 DC-3s, 11 C-54s, 4 DC-4s, 6 DC-6s, 5 L-49s, 12 L-749s, 7 Convair-Liners and 2 Auster J-1s. DC-3s on the European routes will gradually be replaced by Convair-Liners.

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49-6

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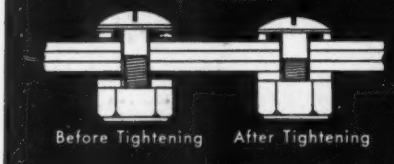

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Sweden's Air Power Is Potential

It has all facilities for production, but finding funds to divert from economic recovery is problem.

By G. Howard Smith

STOCKHOLM—Sweden has fewer people in the whole country than in the city of New York, but its air arm is imposing. Today's fighter force is about as big as the one which stopped the Nazis in the battle of Britain.

The question is, can the Swedish air force fulfill its function? It is the only one in Scandinavia, and its function must be to help the ground forces hold off attack long enough for Western aid to be effective when it arrives.

Everything depends on whether the Russians want to start a war. If they should do it in the next year, then the outlook for Scandinavia would be black. Swedish military experts calculate that the Russians could keep as many fighters in the air over Swedish territory as Sweden has altogether.

► **Different Situation**—At a later date, the situation might be different—all depending on the quantities and types of planes the Western powers are able (and willing) to supply Scandinavia. Norway is beginning to build up an air force with British Spitfires and Vampires, but Denmark has not even got over the starting line. Denmark's difficulties in placing orders suggest that the country is not regarded as a good risk from the military viewpoint.

► **Facilities**—Apart from the disadvantage of working alone and not sharing in the latest fruits of American research, Sweden does have all the facilities for airplane production. The country has a highly developed metal working industry, skilled workers, and a remarkable corps of highly trained engineers.

At the moment Sweden is facing the dilemma of all European countries trying to recover their economic footing and rearm at the same time. It is not just the question of guns or butter. A small country's resources are limited, and even Sweden's rearming depends on the success of the export drive.

For this reason, air force expansion desired by military leaders has been left hanging in next year's budget (1949-50). Compared with the current year, allocations have been cut 15 million kronor to 110 million. That is the amount presumed needed for payments, but the air force is authorized to place orders for another 200 million kronor.

► **Strength**—Total costs for the seven-year program, which includes the 50 percent increase in fighter strength and raising the number of planes in each wing from 45 to 70 craft, is estimated at close to 1.1 billion kronor.

Included in the equipment of the 10 existing day fighter wings are 140 Mustangs, 70 Vampires Mark I, and an unrevealed number of Swedish built J-21s (both prop and jet propelled). They make a total of 500-600 planes. In addition there are on order, and in process of delivery, 120 Vampires Mark VII, 70 of the latest type Spitfires (for reconnaissance), and 45 Mosquitoes for a new night fighter wing.

► **Attack Wings**—One of the so-called attack wings is equipped with prop-driven J-21s, the other four with Swedish twin-engine and single engine light bombers. Sole purpose of these wings is to join in ground operations.

The SAAB Airplane Co. is at present engaged in production of jet-propelled J-21s and is still working on the prototype of the J-29. Stepping up of the production rate of Scandia passenger plane still awaits foreign orders since Swedish ABA lines have ordered only 10.

De Havilland Goblin II turbine engines are being manufactured on license by Svensk Flygmotor AB—the Swedish version being called Gobin III. De Havilland Ghost engines are to be produced shortly by this company.

Canada's Value as U. S. Ally

TORONTO—Canada's civil aviation production may be in competition with American manufacturers of private and transport craft, but Canadian military air power, in any war emergency, probably would be combined with American air might to form a North American bloc.

In the light of that, here's what Canada could contribute now:

The Royal Canadian Air Force in the past calendar year has increased manpower from 11,600 officers and men to 14,000. Postwar work has been divided:

- A search and rescue service which is in use at least once a week in some part of Canada.
- Development of a transport command, which last year flew 113,000 hours, as compared to 64,000 hours in 1947.
- Aerial photography of 911,000

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square miles by two photo survey squadrons.

• Establishment of the first two jet-powered interceptor squadrons.

▶ **Jet Squadrons**—RCAF now has 10 auxiliary squadrons throughout Canada, all equipped with Vampire jet fighters. A new photography squadron of eight Lancaster aircraft is to be formed this summer, with some of the planes equipped to use SHORAN.

The RCAF budget estimate for the current fiscal year ending Mar. 31, 1949, is tabled in Parliament at $80 million, up from $58,130,000 in the fiscal year 1947-48.

▶ **Other Estimates**—Other budget estimates: Navy, $50 million; Army, $95 million; defense research (including air research), $16 million.

Much of the air research has been spent on development of a twin-engined jet fighter at the Malton plant of A. V. Roe Canada Ltd.

Royal Canadian Navy air arm consists of British Firefly Mark IVs and Vs, on the aircraft carrier HMCS Magnificent.

▶ **Manufacturing** — Canadian aircraft manufacturing is mainly in the Toronto and Montreal areas. At Toronto, A. V. Roe Canada Ltd., is working on a secret jet fighter for the RCAF, and is completing the prototype of a jet propelled commercial transport. It has also developed the first jet-powered Chinook engine.

De Havilland Aircraft of Canada, Ltd., Toronto, is building Chipmunk trainers for RCAF and Beaver single-engine transports for provincial government and commercial operations.

▶ **Montreal**—At Montreal, Canadair Ltd., is working principally on their version of the DC-4, powered with British Rolls Royce Merlin engines. Canadair has orders from Trans-Canada Airlines, Canadian Pacific Airlines, RCAF and BOAC.

Canadian Car and Foundry Ltd., Montreal, is modernizing North American Harvard trainers for the RCAF and Firefly aircraft for the Navy, as well as manufacturing Norseman single-engine transports. It is also designing a new Burnelli Loadmaster, a model of which is now undergoing wind tunnel tests in Ottawa.

▶ **Purchases**—Last year, the RCAF bought aircraft in U.S. and Canada valued at $7,300,000 and appropriated $10,377,000 for modernization of 209 aircraft. Many trainers and bombers, including Canadian built Lancasters and Lincolns, are in storage at Canadian aircraft plants, surplus from World War II. Meanwhile, RCAF types of planes in use are known to include Canso amphibians, Norseman, DC-3s (Dakotas), DC-3s (North Stars), jet-powered Vampire fighters, and a number of other

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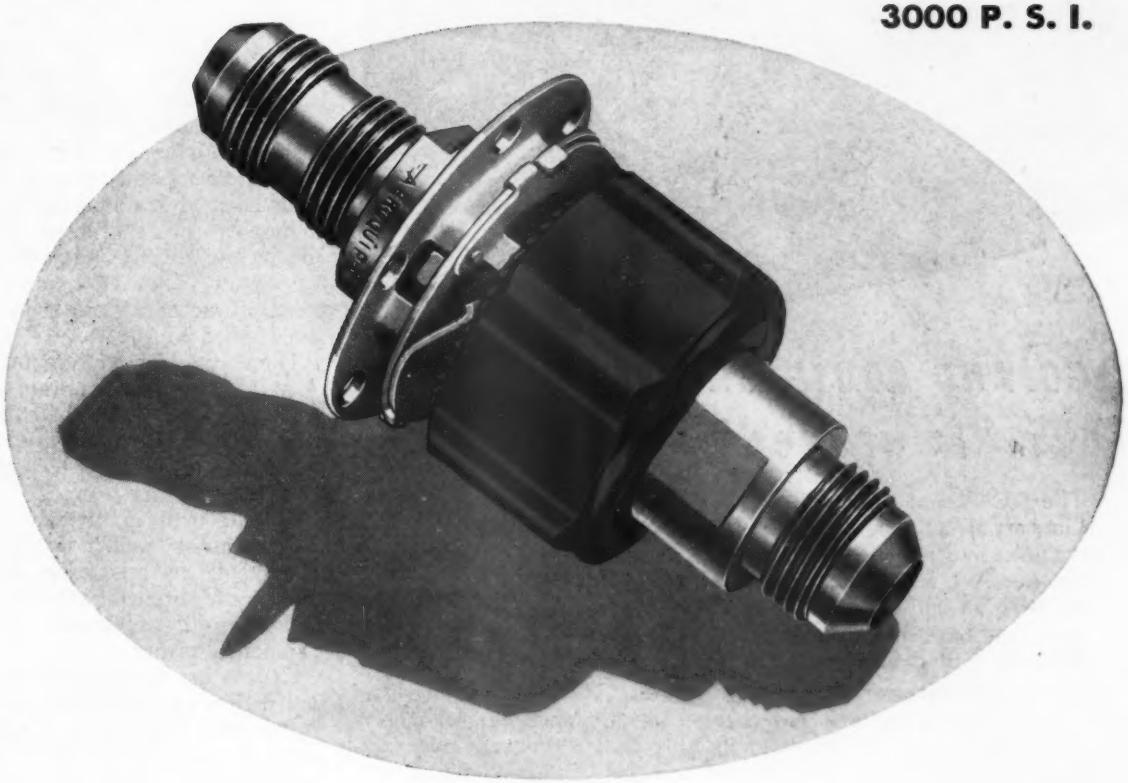

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combat types on which no data is available.

► **Production**—Canadian aircraft production for 1948 can only be estimated. De Havilland Aircraft turned out about 20 Beaver transports and an unstated number of Chipmunks. Canadair finished delivery of 20 DC-4M aircraft to TCA, has orders for 22 to BOAC and four to CPA.

The country's revived aircraft industry employs approximately 12,000 people.

No 1948 calendar year data is available as yet on civilian air operations. Dominion Bureau of Statistics, Ottawa, reports that for the first eight months of 1948 a total of 209,000,000 revenue passenger miles were flown in Canada, and a total of 2,950,000 revenue ton miles were flown.

This includes only domestic scheduled and non-scheduled operations.

► **Private Flying**—Based on figures for 1947, there are now about 2000 private pilots licensed in Canada, close to 3000 commercial pilots licensed, and about 300 private aircraft and 2000 commercial aircraft. (These are estimated figures based on increases from 1946 to 1947, and applied to 1948.)

There are 650 airports in Canada, close to 300 being private and unlicensed. This total includes water anchorages. There are 300 federal, provincial or municipal airports in Canada.

Aircraft used in civilian operations include most well-known American-made planes for private use, large number of war surplus transports, and an assortment of well-known U. S. small commercial planes.

Canada has started pushing air training, with a government bonus of $100 to the club training each pilot who passes his tests, $100 to the trainee on completion of his training, and a further $100 if the trainee joins RCAF or RCAF reserve.

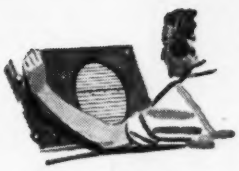
Exports Reviving Italian Industry

ROME—Italy's aircraft manufacturing plants survived the war. But inactivity imposed by the armistice, limitations placed on production by the peace treaties, near-total cessation of Government orders and the extremely limited demand on the home market, make it impossible to speak of a revival of this industry.

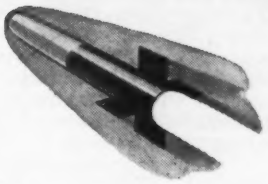
Only a few firms, such as FIAT, S.I.A.I. Marchetti, S.A.I. Ambrosini and Macchi are actually manufacturing. Their main markets are foreign.

► **Foreign Orders**—FIAT has an order from Argentina for 45 G-55s for training fighters and 70 G-46s for aviation schools. Egypt has also ordered 19

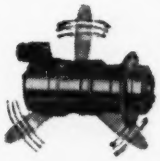
ANTICIPATING AVIATION'S EVERY FORWARD STRIDE



GCA and Flight Path Control all-weather landing systems



Guided Missile Research



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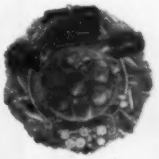
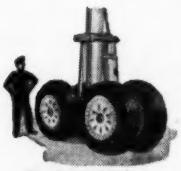


Fuel metering and ignition systems for jet and reciprocating engines



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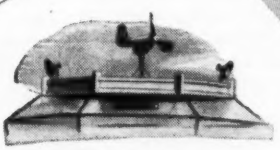

Weather Bureau and flight forecast data stem from Bendix meteorological instruments

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Bendix builds for the newest jets, modern passenger airliners, and the B-36, world's largest bomber, pictured above.

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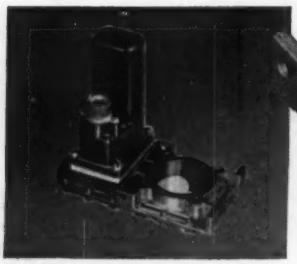
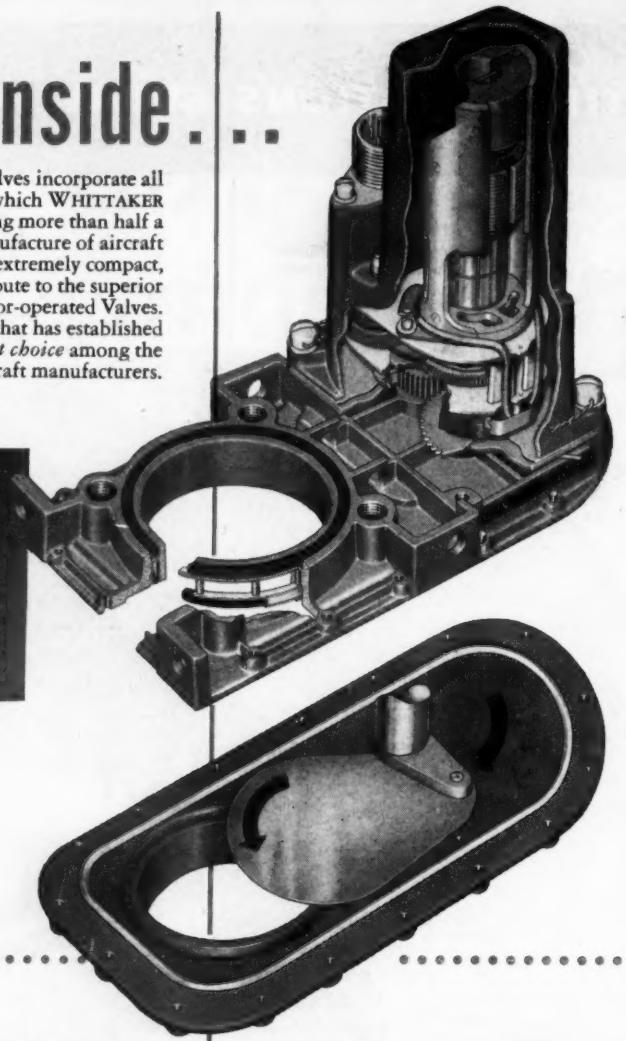
AVIATION CORPORATION

what's inside...

WHITTAKER Motor-operated Slide Valves incorporate all of the flight-proven, time-tested features which WHITTAKER has pioneered and perfected during more than half a decade of specialized experience in the manufacture of aircraft valves. These features, combined with extremely compact, lightweight construction, contribute to the superior operating performance of WHITTAKER Motor-operated Valves. And it is this outstanding performance that has established WHITTAKER Valves as *first choice* among the world's leading aircraft manufacturers.





INDIVIDUALLY ENGINEERED DESIGNS. WHITTAKER Valves are designed, engineered, and constructed to meet *your* specific requirements. Years of painstaking research and testing have developed certain basic valve patterns. WHITTAKER'S staff of design and research engineers apply your valve requirements to these proven basic designs.

and what goes into...

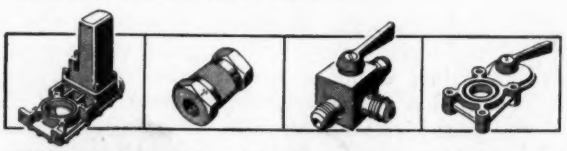
RIGID SHOP INSPECTION AND TESTING. WHITTAKER Valves are carefully checked and inspected at every stage of manufacture. Before leaving the factory, valves are tested under actual operating conditions for strength, leakproof closures, smoothness of operation, etc. —your assurance that they will do the job for which they are designed and constructed.

MODERN, FULLY INTEGRATED MANUFACTURING FACILITIES. Only the highest quality materials and precision workmanship are used in the manufacture of WHITTAKER Valves. Special machines and production techniques further promote the quality of the finished product. Both valve bodies and actuator assemblies are manufactured in WHITTAKER'S modern, completely integrated plant.

FIELD SERVICE. WHITTAKER maintains a staff of technically trained, field service engineers. These men are thoroughly experienced in aircraft valve design and application, and stand ready to assist you on any valve design, installation, servicing, or replacement problems.

Individually engineered designs... easier installation ... better performance... lower maintenance... longer life! These are the benefits you get with WHITTAKER specialized aircraft valves. WHITTAKER'S versatile engineering staff stands ready to link the economies of proven design to your specific requirements. WM. R. WHITTAKER CO., LTD., 915 N. CITRUS AVE., LOS ANGELES 38, CALIF.

valves by *Whittaker*



Motor-operated slide valves | Check valves | Plug valves | Lever operated slide valves

First IN DESIGN

First IN PERFORMANCE

First WITH VALVES THAT ARE FIRST CHOICE IN INDUSTRY

G-55s. Macchi has already supplied Egypt with 24 M.C.205s for training fighters, while Breda is working on an Argentine order of three four-engined B.Z.308s.

One reason the Italian market has appeal: low construction cost. Most of the planes are built of wood. The engines are almost exclusively foreign-make since Italy's limited production does not call for home production of a wide range of engines.

▶ **Air Force**—Italy's air force, under peace treaties, is allowed a total of 350 planes, of which 200 are fighters and 150 are transports and training craft. The air fleet is now composed of 80 Spitfires, 48 Mustangs and 56 P-38s, all of which are without spare parts. Also included under the peace treaty, but of no military efficiency use: 31 three-engined S.I.A.I. Marchetti S-82s, 19 three-engined FIAT F-12s, around 80 one or two-place planes used for training, and some three-engined S.I.A.I. Marchetti S-79s, built before the war and now too ancient to be safe.

The Italian government has approved an aviation budget of 27.7 milliard lire for 1949-50. Of this, 4750 million lire, almost $8 million, is for upkeep of existing aircraft and production of new aircraft. In effect, the government has virtually renounced even a partial renewal of its pre-war aviation industry—an enterprise that employed over 100,000 workers and produced 4000 aircraft and 8000 engines during the course of a year.

▶ **Foreign Patents**—Compared to some other foreign production schedules, Italy is at least five years behind the times.

In the case of jet aircraft, it will have to make a start by producing new engines and aircraft under foreign patent grants.

The Ministry of Aeronautics has drawn up a plan to provide aircraft for Italy's civil carriers, which should be carried out in four years at a cost of about 170 milliard lire (approximately $300 million). Included in the plan is the proposed production of turbojet powerplants and prototype construction of a jet aircraft.

Execution of the plan will depend on securing the necessary financing. This is its weak point.

Italy's civil transport network is still waiting for some official word on subsidation. Many carriers have discontinued operation. Others, with aircraft secured mostly from U. S. surplus, fly over one million kilometers a month. But they are losing money. They feel that Italy's government will sooner or later have to follow the lead of other countries and provide some sort of financial aid.

Czech Air Industry Is Centralized

PRAGUE—Centralization is the byword for Czechoslovakia's aircraft industry. Last month, the entire industry was concentrated into one enterprise: Let Aircraft Works, National Corp.

The Let Corp. is responsible for manufacture, repair, purchase and sale of aircraft and engines; it also will do the same thing for automobiles. The enterprise replaces three nationalized corporations which have functioned since war's end: the prewar factories of AVIA of Zlin, AERO, and the LETOV, Walter & Automobile Works, as well as the airplane departments of Skoda and CKD.

▶ **Russian Planes Purchased**—Czechoslovak Airlines, the country's air carrier, is also maintained. Its plans for the purchase of Lockheed Constellations or Canadair aircraft, intended to bolster the carrier's three Siebels, three Junker 52s and twenty-odd DC-3s, apparently have been shelved in favor of the Soviet-built Ilyushin II-12, two of which were delivered in January.

The Ilyushin, which carries 32 passengers and a crew of five, will be the most modern planes used by Czechoslovak Airlines, and will help the carrier towards its goal of flying 7.5 million kilometers this year.

▶ **Design Sports Planes**—Czech designers and technicians are working on training, sports and passenger planes. After extensive aeronautical and production tests, the most suitable types will go into serial production. At this point, the auto and aircraft sections will be separated.

The PRAGA Air Baby with enclosed cabin for two passengers is one of Czechoslovakia's most popular private planes.

In addition to the Air Baby, the sports model SOKOL M1-C, with cabin for three passengers, Walter-Minor 4-III 105 hp. powerplant and maximum cruising speed of 240 km. per hour, has been sold to the Mulhouse (France) Aeroclub.

▶ **Restricted**—On the restricted list are the twin-rotor PRAGA helicopter which has made its appearance at several public events, and presumably a jet plane which was scheduled to take part in a military parade later cancelled because of bad weather.

Aircraft engine factories are producing the Mikron III, Minor 4-III, and Minor 6-III, powered by Walter engines of 65 hp., 105 hp. and 160 hp. They are also working on the development of opposed-cylinder engines for sports planes, and with these they claim extensive pre-war experience.

Custom Built

MOTORS, ACTUATORS

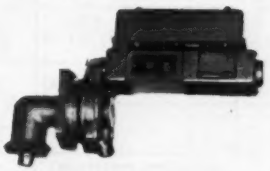
for YOUR design requirements

COMPLETE PACKAGED POWER UNITS FOR EVERY AIRCRAFT APPLICATION

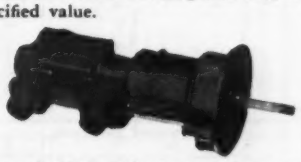
FOR almost a decade, Hoover-designed actuators have been specified on the highest performance aircraft. Today, they are meeting the severest load and operating requirements on the most advanced military planes in production and service.

All Hoover actuators contribute to airframe manufacturing economy because they are designed for quick installation on the assembly line.

Designed for in-flight adjustment of the horizontal stabilizer of a jet fighter, this actuator, weighing 12.5 pounds, will withstand an ultimate load of 15,000 pounds without failure.



For positive cockpit sealing, this power unit utilizes a unique torque limiting clutch, with no frictional parts, the load being transmitted by spring loaded rollers. It has operated 5,000 consecutive times with a maximum variation in torque of 15% from specified value.



To regulate pressurization on a heavy bomber, this actuator is controlled by a direct pressure measuring device through a potentiometer. It includes a 9360 to 1 triple planetary gear reduction, with 500 inch-pounds normal load rating and the motor shaft can be braked so sharply that travel of the output shaft is limited to ½ degree.

Consult Hoover Electric Company for:

SPECIAL MOTORS • SPECIAL GEARING COMPLETE POWER PACKAGE UNITS

For A.C. or D.C. power source with magnetic clutches and brakes, built in limit switches, potentiometers, thermal overload relays, radio noise filters, pressure tight shaft seals, with linear or rotating power takeoff.

Experimental or Production Quantities

HOOVER ELECTRIC COMPANY

2100 South Stoner Avenue
Los Angeles 25, California

Principal Foreign Aircraft and Gas Turbine Engines

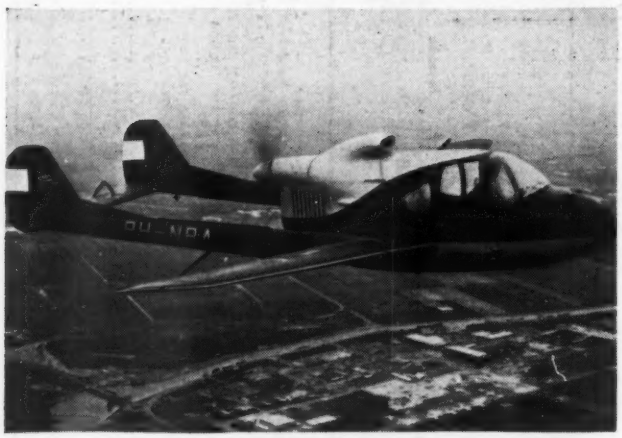
Manufacturer	Designation	Category	Number of crew (or pilots)	Number of passengers	Powerplant: Number and make of engines	Powerplant: Normal rated hp. (or maximum continuous)	Powerplant: At rpm.	Performance: Cruising speed, mph.	Performance: At Altitude (ft.)	Performance: S.L. climb at gross weight (fpm.)	Performance: Normal range, mi.	Performance: Service Ceiling	Weights: Gross weight, lb.	Weights: Empty weight, lb.	Dimensions: Span	Dimensions: Length	Dimensions: Height	Remarks
Great Britain																		
Airspeed, Ltd.	Ambassador	Transport	7	40	2 Bristol Centaurus 661	2310	2400	312	21500	1570	1750	.....	52000	34398	115'	80' 9"	18' 10"	$540,000; 0.023¢ / pass.-mile
Armstrong Whitworth Co., Ltd.	Apollo	Transport	5	24	4 A.S. Mamba turboprop	....	....	305	20000	2100	1500	35000	39500	.....	92'	70' 11"	25' 1"	307 lb. thrust; fly spring, 1949
A.V. Roe & Co., Ltd.	Athena 1	Trainer	3	..	Mamba/Dart turboprop	....	....	253	10000	2630	635	34800	7438	5580	40'	36' 6"	11' 11"	Mamba version flown; Dart delayed
	Athena 2	Trainer	2	..	R. R. Merlin 35	....	....	223	10000	....	635	28000	8103	.....	40'	37' 6"	11' 11"	.....
	Tudor 4	Transport	6	32	4 R. R. Merlin 621	1180	2650	282	20000	800	2910	27400	80000	39441	120'	85' 3"	24'	.....
Boulton Paul Aircraft, Ltd.	Balliol 1	Trainer	3	..	A. S. Mamba turboprop	....	....	269	10000	2200	675	.....	7845	5732	39' 4"	36' 6"	10' 7"	.....
Bristol Aeroplane Co., Ltd.	Brabazan 1	Transport	12	120	8 Bristol Centaurus 20	2160	2400	285	25000	750	5000	25000	290,000	169,000	230'	177'	50'	Research airplane; fly spring, 1949
	Type 170	Transport	4	36	2 Bristol Hercules 672	....	....	207	3500	1090	1150	21100	40000	27586	108'	68' 4"	21' 6"	Pass or freight versions
	Type 171	Helicopter	1	5	Alvis Leonides	....	....	107	.....	1050	340	17500	5200	3712	47' 5"	45' 6"	11' 8"	Wood blades; metal scheduled
	Type 175	Transport	6	50	4 Bristol Centaurus 663	....	....	310	20000	....	2300	.....	118,000	.....	130'	115'	34' 6"	Proteus turboprops planned
Chrislea Aircraft Co., Ltd.	Super Ace	Personal	1	3	D. H. Gipsy Major 10	....	....	110	S.L.	700	400	15000	2350	1350	36'	21' 6"	7' 8"	.....
DeHavilland Aircraft Co., Ltd.	Vampire 3	Fighter	1	..	D. H. Goblin 2	....	....	...	.....	4350	1145	43500	12170	.....	40'	30' 9"	6' 2"	.....
	Vampire	Fighter	1	..	.....	....	....	...	.....	....	....	.....	.....	.....	38'	30' 9"	6' 2"	.....
	Dove	Transport	2	8	2 D. H. Gipsy Queen 70	305	....	179	8000	750	920	.....	8500	5625	57'	39' 4"	13'	$75,600; 250 cmpltd; 100 on order
Fairey Aviation Co., Ltd.	Firefly 5	Attack	2	..	R. R. Griffon 74	2250	2750	...	.....	....	760	.....	13479	9946	41' 2"	38'	16' 6"	Recon., night, ASW versions
	Firefly Trainer	Trainer	2	..	R. R. Griffon 12	....	....	...	.....	....	805	28000	12000	.....	44' 6"	37' 7"	.....	.....
	Primer	Trainer	2	..	Blackburn Cirrus Major 3	....	....	125	S.L.	940	376	16800	1960	1360	32' 10"	27' 6"	6' 11"	Also D. H. Gipsy Major
	Gyrodyne	Helicopter	1	3	Alvis Leonides 501	400	2800	100	S.L.	....	230	18000	4500	3270	52'	.....	.....	Tractor prop
Gloster Aircraft Co., Ltd.	Meteor 4	Fighter	1	..	2 R. R. Derwent 5	2700	13600	555	S.L.	7350	950	44500	15175	10740	37' 2"	41'	13'	Belgium & Holland A.F.
	Meteor 7	Fighter	1	..	2 R. R. Derwent 5	2700	13600	535	20000	7920	520	46000	14175	10475	37' 2"	43' 6"	13'	RAF & export
Handley Page, Ltd.	Hastings 1	Transport	5	50	4 Bristol Hercules 101	....	....	293	25000	1100	1150	26700	75000	50315	113'	81' 8"	22' 6"	30 paratroops; 50 troops
	Hermes 4	Transport	7	63	4 Bristol Hercules	1360	2400	300	24000	1380	3625	24900	82000	53137	113'	96'	29' 11"	$243.33 per hr. cost
	Hermes 5	Transport	7	63	4 Bristol Theseus	....	....	349	10000	1925	2820	29500	84000	50900	113'	96'	29' 11"	Turboprop version
Hawker Aircraft, Ltd.	Sea Fury 11	Fighter	1	..	Bristol Centaurus	2160	....	290	10000	4300	1800	.....	12350	.....	.....	.....	.....	Export model; recon., bomb versions
Percival Aircraft, Ltd.	Prince	Transport	2	10	2 Alvis Leonides	....	....	177	10000	....	....	24000	10650	7508	56'	42' 11"	16' 1"	.....
Saunders-Roe, Ltd.	SR 45	Transport	12	100	10 Bristol Proteus	....	....	380	35000	....	5500	.....	315,000	.....	220'	148'	.....	Engines paired; flying boat
	Sealand 1	Transport	2	8	2 D. H. Gipsy Queen 70	....	....	181	.....	880	665	21600	9100	.....	59'	42'	.....	$60,200; amphibian
	Sealand 2	Transport	..	..	2 Alvis Leonides	....	....	193	.....	1250	865	.....	10130	.....	68'	.....	.....	Enlarged Sealand 1
Vickers-Armstrongs, Ltd.	Attacker 1	Fighter	1	..	R. R. Nene	....	....	355	30000	6350	410	45000	11300	.....	36' 11"	37' 6"	9' 7"	Cannon, rockets & bombs
	Viscount	Transport	4	32	4 R. R. Dart	....	....	275	20000	....	800	30000	41000	28150	89'	74' 6"	26' 9"	No. 2 to have Naiad turboprops
	Viking 1B	Transport	4	34	2 Bristol Hercules 634	775	1750	210	20000	....	...	.....	34000	23000	89' 3"	65' 2"	19' 6"	8 for BEA; 250 for RAF
Australia																		
DeHavilland Aircraft Pty., Ltd.	Drover	Transport	1	8	3 D. H. Gipsy Major 10	142	2400	140	5000	800	500	.....	6500	4100	57'	37'	10'	.....
Canada																		
Can. Car & Foundry Co., Ltd.	Norseman	Transport	2	8	P & W Wasp AN-1	550	2200	141	5000	1000	950	15500	7400	4250	51' 6"	32' 4"	13' 9"	.....
Canadair, Ltd.	Four	Transport	4	55	4 R. R. Merlin 626-1	1480	2850	320	25000	1045	3880	.....	82000	46832	117' 6"	93' 7"	27' 6"	.....
Cancargo Aircraft Mfg. Co., Ltd.	Loadmaster	Transport	2	..	2 P & W 2SD13G	1200	2550	196	10000	1280	1440	.....	28500	18000	86'	54' 6"	13' 4"	Cargo; lifting fuselage design
DeHavilland Aircraft of Canada, Ltd.	Beaver	Transport	1	6	P & W Wasp Jr. AN6B	400	2200	148	S.L.	1290	560	.....	4650	2800	48'	30' 3"	10' 7"	.....
	Chipmunk	Trainer	2	..	D. H. Gipsy Major 10	130	2100	124	S.L.	930	485	17200	1930	1320	34' 4"	25' 5"	7'	.....
France																		
Arsenal	VG70	Fighter	1	..	Junkers Jumo	....	....	...	.....	....	650	30000	6850	5500	27' 11"	31' 10"	7' 6"	Research; swept wing
	VG90	Fighter	1	..	R. R. Nene	....	....	...	.....	....	1650	.....	15400	.....	27'	.....	.....	Carrier fighter;
	C128	Research	..	..	.....	....	....	225	.....	....	1000	.....	2970	.....	.....	.....	.....	Checks wind tunnel results
Breguet	761	Transport	..	101	4 Gnome-Rhone 14R	800	2400	220	10000	....	5000	.....	82500	.....	136' 6"	94' 2"	27' 2"	Prototype flight 1949
Languedoc	161	Transport	..	33	4 Gnome-Rhone 14R	800	2400	240	.....	....	1500	.....	52800	.....	96' 6"	79' 7"	18' 2"	Several manufacturers
Latecoere	631	Transport	..	54	6 Wright Cyclone A5B	1350	2300	200	.....	....	3800	.....	158,500	.....	188' 4"	142' 6"	18' 6"	Air France flying boat
Leduc	010	Research	1	..	Ramjet	....	....	...	.....	....	....	.....	5500	3740	.....	.....	.....	Launched from transport @ 15000'
Mauboussin	CM100	Transport	..	..	2 Renault 12S	....	....	160	6000	....	600	.....	16000	10700	87' 6"	58' 8"	19' 1"	High-wing monoplane
Morane	MS472	Personal	2	..	.....	....	....	...	.....	....	....	.....	5280	3850	35'	28' 2"	11' 9"	.....
Marcel Dassault	315	Transport	..	..	2 Renault 12S	....	....	190	5000	....	1500	.....	12500	9900	67' 10"	41'	14' 9"	Air Force transport
	MD450	Fighter	1	..	R. R. Nene	....	....	....	.....	....	1000	.....	13200	.....	.....	.....	.....	Prototype only
S.N.C.A.C.	NC270	Bomber	..	..	2 jet	....	....	....	.....	....	2250	.....	61500	.....	.....	.....	.....	Swept wing
	NC211	Transport	..	..	4 Gnome-Rhone 14R	800	2400	175	.....	....	1200	.....	90000	.....	.....	.....	.....	"Cormoran"; prototype crashed
	NC1080	Fighter	1	..	R. R. Nene	....	....	....	.....	....	800	.....	15400	.....	.....	.....	.....	Navy jet fighter
	NC2200	Fighter	1	..	R. R. Nene	....	....	....	.....	....	....	.....	16500	.....	.....	.....	.....	Navy jet fighter, swept wing
	NC3021	Research	..	..	Daimler-Benz 610	....	....	260	.....	1968	....	42000	22900	.....	73' 2"	56'	20'	Cosmic ray research
S.N.C.A.N.	Nord1500	Bomber	..	..	2 Gnome-Rhone 14R	....	....	250	.....	....	2000	30000	.....	15600	64' 6"	46' 9"	21' 5"	Torpedo, dive bomber

Manufacturer	Model	Type	Compressor Stages	Turbine Stages	Pressure Ratio	Static Thrust, lb.	At rpm	Rated Thrust, lb.	At rpm	At altitude, ft.	Maximum Overspeed, rpm.	Shaft hp	At rpm, sea level	Spec. fuel cons., lb./lb./hr.	Turbine inlet, F. deg.	Tailpipe, F. deg.	Length, in.	Dia., in.	Weight, dry, lb.
GREAT BRITAIN																			
Armstrong Siddeley	Mamba 1	TP	10AF	2	.....	....	.....	307	15000	..	.....	1010	15000	.....	....	....	57	31	760
	Mamba 2	TP	....	.	.....	....	.....	384	15000	..	.....	1270	15000	.....	....	....	.....	....	780
	Python 1	TP	14AF	2	.....	....	.....	1150	8000	..	.....	3670	8000	0.68	....	....	96	48	3150
Bristol	Theseus	TP	9AF1CF	3	.....	....	.....	590	8200	..	.....	2200	8200	0.65	....	....	82.6	49	1860
	Proteus 1	TP	.....	.	.....	....	.....	800	10000	..	.....	3200	10000	....	....	....	99.75	38.5	2900
DeHavilland	Goblin 2	TJ	1CF	1	.....	3000	10200	1920	8700	SL	.....	....	.....	1.23	1470	1245	107	50	1482
	Goblin 3	TJ	1CF	1	.....	3300	10750	2800	10250	..	.....	....	.....	1.16	....	....	100.5	50	1573
	Ghost	TJ	1CF	1	.....	5000	10000	....	9500	..	.....	....	.....	1.06	....	....	115.5	53	2011
Metropolitan-Vickers	Beryl 1	TJ	10AF	1	4:1	3850	7750	3670	7600	..	10000	....	.....	1.423	....	....	161	37.9	1785
Napier	Naiad	TP	12AF	2	.....	....	.....	241	18250	..	.....	1500	18250	0.732	....	....	102	28	1095
Rolls-Royce	Derwent 5	TJ	1CF	1	.....	3600	14700	2675	13600	..	.....	....	.....	1.4	....	....	83.1	43	1280
	Nene 2	TJ	1CF	1	.....	5000	12300	4000	11600	..	.....	....	.....	1.4	....	....	96.8	49.5	1755
CANADA																			
A. V. Roe	Chinook	TJ	9AF	1	.....	2600	10100	....	.....	..	.....	....	.....	.....	....	....	125	32	1250
FRANCE																			
Cie, Electro-Mecanique	TGAR-1008	TJ	.....	.	.....	5075	6700	4200	6400	..	.....	....	.....	.....	....	....	.....	....	....
Rateau	SRA-1	TJ	16AF	2	4.2:1	2750	7500	....	.....	..	.....	....	.....	1.0	1382	....	82.6	48	2200
S.N.E.C.M.A.	ATAR-101	TJ	7AF	1	4:1	4400	7500	....	.....	..	.....	....	.....	.....	....	....	156	35	....

AF - *axial flow* CF - *centrifugal flow* TP - *turboprop* TJ - *turbojet*

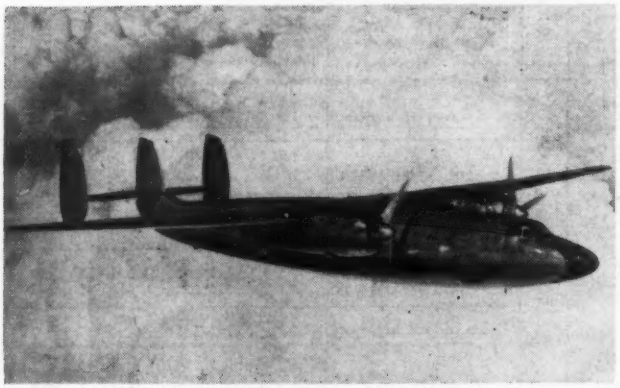
Manufacturer	Designation	Catagory	Number of crew (or places)	Number of passengers	Powerplant: Number and make of engines	Powerplant: Normal rated hp. (or maximum continuous)	Powerplant: At rpm.	Performance: Cruising speed, mph.	Performance: At altitude (ft.)	Performance: S.L. climb at gross weight (fpm.)	Performance: Normal range, mi.	Performance: Service Ceiling	Weights: Gross weight, lb.	Weights: Empty weight, lb.	Dimensions: Span	Dimensions: Length	Dimensions: Height	Remarks
	NC1071	Bomber	..	..	2 R. R. Nene 1	....	....	...	.....	....	....	.....	26400	.....	65' 3"	34' 5"	.....	Torpedo bomber
S.N.C.A.S.E.	SE1010	Photo	..	..	4 Gnome-Rhone 14R	....	....	325	.....	....	4500	28000	59000	43500	101' 8"	71' 6"	17' 3"	High altitude recon.
	SE2010	Transport	..	84	4 P & W Wasp Major	2650	2550	300	18000	....	2500	.....	160,000	.....	164'	129'	44'	Jet engines planned; prototype completed
S.N.C.A.S.O.	SO6020	Fighter	2	..	R. R. Nene	....	....	...	.....	....	1000	.....	.....	.....	.....	.....	.....	Improved SO-6000; has flown
	SO8000	Fighter	1	..	Junkers Jumo 213	....	....	...	.....	....	1500	.....	13200	.....	.....	.....	.....	Pusher carrier fighter
	SO4000	Bomber	..	..	2 R. R. Nene	....	....	...	.....	....	....	.....	57000	.....	.....	.....	.....	Swept wing
	SO6000	Fighter	2	..	R. R. Nene	3900	11500	...	.....	....	....	.....	6400	4000	30'	34' 4"	11' 7"	First French jet
	SO90P	Transport	..	30	2 P & W R-2800B43	....	....	250	20000	....	....	.....	40000	.....	88' 3"	62' 2"	13' 5"	Air France transport
Holland																		
Fokker	Instructor	Trainer	2	..	Lycoming O-435-A	110	2100	106	S.L.	730	390	15100	2375	1730	36'	26' 9"	7' 8"	.....
	Promotor	Personal	1	3	Lycoming O-435-A	110	2100	130	3300	615	385	12000	3140	2135	39' 5"	27' 9"	8' 1"	.....
Sweden																		
Saab	21R	Fighter	1	..	D.H. Goblin	....	....	...	.....	....	....	.....	.....	....	38' 1"	34' 3"	9' 6"	Jet version of 21A
	29	Fighter	1	..	D.H. Ghost	....	....	...	.....	....	....	.....	.....	....	.....	.....	.....	Swept wing
	90A-2	Transport	3	32	2 P & W R-2180 E1	1300	2600	250	10000	1475	1060	.....	32408	21791	95' 10"	70'	24' 3"	Scandia; tricycle gear
	91	Personal	1	2	D.H..Gipsy Major 10	120	2300	154	S.L.	1050	585	15100	2370	1345	34' 10"	25' 9"	7' 3"	Safir, $11,000

Interesting Foreign Aircraft



Fokker Promoter

Gloster Meteor 7 (Great Britain)

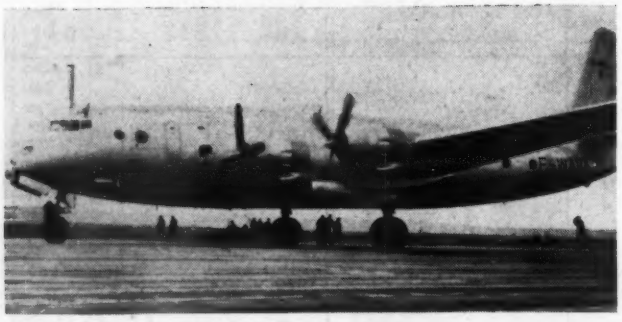


Airspeed Ambassador (Great Britain)

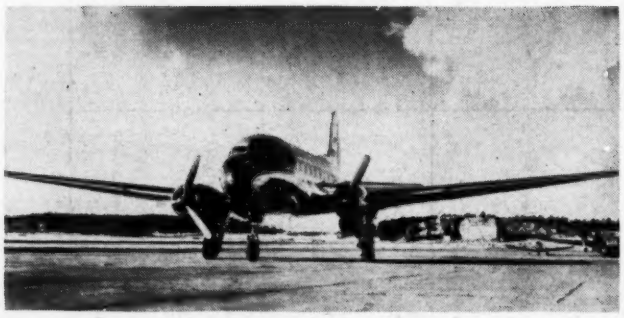
De Havilland Vampire (Great Britain)

Saab-29 (Sweden)

Bristol 175 (Great Britain)



SE-2010 (France) (INP Photo)



Saab-90 Scandia (Sweden)

The Birdmen's Perch

By *Major Al Williams*, ALIAS, "TATTERED WING TIPS,"
Gulf Aviation Products Manager, Gulf Bldg., Pittsburgh 30, Pa.

Four fellahs wrote in to us and asked for a picture of our old F3F. Ex-service pilots who'd seen us demonstrate aerobatics in the old Gulfhawk during the war.

They said that she must be a pretty sweet type of aireoplane. And could they please have pictures of her.

Pictures! Heck, we'd practically give our right arm to anyone who says nice things about that stubby little sweetheart. But they didn't ask for a right arm, so we sent 'em pictures. In fact, we sent 'em pictures of the old Gulfhawk (the F3F) and the new one (F8F)! Autographed 'em, too.

Then we got to wondering if any of you Perch Pilots had the same affection for these two fireballs that we do.

Anyhow, we ordered up a stack of pictures of the two Gulfhawks which we'll send to you as long as the supply holds out. Handsome 8 x 10 glossy prints they are, and we signed every one of them!

Let us know where to send them, and they're yours! (And you might send in a Little Known Fact, if you're extra bright!)

They're free and the address is at the top of the page.

GETTING YOUR BEARINGS

Know what an additive is?

We're going to tell you right now because there are some mighty important additives in Gulfpride-Aviation Series D, the great new Gulfpride Oil for horizontally opposed aircraft engines.

Well sir, when the shaft starts really RPMing, it gives the oil that's lubricating the bearings a very tough time, indeed!

The engine gets so hot that it has a tendency to break down the oil and oxidize it fast!

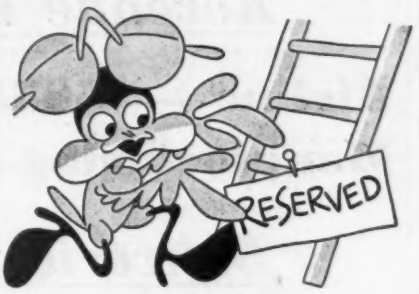
And unless this oxidation is slowed down, the oil wears out fast and sometimes the engine does too!

So, along with being the only lubricant for light aircraft engines which has been put through the extra Alchlor Process refining step, Gulfpride-Aviation Series D has an *additive* which is an oxidation inhibiter to slow way down on that harmful cause of sludging.

Then, to give extra protection to costly bearings, this great oil has another *additive* which eliminates any possibility of corrosion!

And when you remember how it helps to unstick valves and rings and keep them unstuck, how it increases time between overhauls, how it keeps engine innards clean . . . why, this Gulfpride-Aviation Series D adds up to a lot of extra lubrication value, doesn't it?

Better ask for it.



LITTLE KNOWN FACTS DEPT.

We're not getting Little Known Facts About Well-known Planes from very many of you guys!

This is especially alarming in view of all the letters we had when we considered dropping the department. All we can say is "Shame," and how do you ever expect to become a real Perch Pilot (bottom rung) if you don't send in Facts?

So we'll give you one of our own:

"*A plant working on bolts for jet planes had to regrind tools after machining only 8 bolts from a tough nickel-chromium alloy. They tried Gulf Stainless Cutting Oil B, and now as many as 150 bolts are cut before tool regrinding is necessary!*"

How about that?

Now as soon as you call the Gulf Lubrication Engineer and ask him over to help you figure out your lubrication or maintenance problem, sit down and write us a Little Known Fact!

Gulf Oil Corporation and Gulf Refining Company... makers of

GULF **GULF AVIATION PRODUCTS**

ONE OF THE MOST IMPORTANT MAINTENANCE JOBS (YOU DON'T NEED AN A&E EITHER)...
AIRPORT
...IS SIMPLY KEEPING ENGINES, PARTS, SURFACES, CABINS, ETC. SCRUPULOUSLY
...CLEAN! CLEANLINESS AVOIDS AS MUCH MAINTENANCE TROUBLE AS USING...
...GOOD GULF AVIATION GASOLINE.
GULF

In 1949.....

Revenue Will Be:

Airline.....$635,000,000

Manufacturing.....$1,400,000,000

Deliveries Will Be:

Transport Planes---155

Two-place Planes.....2,400

Military Planes.....3,000

Four-place Planes.....3,600

Aviation Revenue to Top $2 Billion This Year

This means operating profit for manufacturers, gain for airlines, and personal sales maintaining level.

In 1949 the manufacturing side of aviation will turn in an operating profit and an industry-wide net profit except where adjustments are made for tax purposes.

The airlines, anticipating that the Civil Aeronautics Board's final mail rates for 1948 will give them a profit for that year, expect to repeat in 1949.

The personal aircraft segment of the industry will at least hold its own, probably pick up a little as business use of the small airplane increases.

The commercial helicopter, "coming" for four years, should at least double its 1948 sales and begin to be as saleable as it is useful.

Those conclusions are reached after studying the mass of material AVIATION WEEK assembled for this issue. But forecasting the level of aviation activity this year is more difficult than at any time since the war.

The aviation industry is divided roughly into three categories: manufacturing (airframe, engine, propellers, accessories); transport (airlines, contract carriers, irregular carriers); and civil flying (charter, instruction, personal and business flying). Here are the factors that must be considered:

▶ **Manufacturing**—The total sum going into this part of the industry from private sources will be less than $250 million. The remainder will come from the government, and the greatest part from the Air Force and Navy.

Payments from these sources bear no relation to shipments and, where made on long-term contracts sometimes are not even included in a manufacturer's sales figures. It is not possible to calculate manufacturing revenue on expected shipments or sales, nor on a basis of the value of airframe weight per pound, nor on worker productivity.

▶ **Transport**—The scheduled airline industry is undergoing a two-stage revolution. Promotional fares, whether classed as "coach," or "family plan," or "roundtrip discount," or whatever, are knocking askew all normal ways of gauging the industry's income level. Second, the certificated carriers' cargo business now has begun mushrooming.

As for the remainder of this segment of aviation—contract and irregular carriers—there are statistics on several of the larger companies, but none industry-wide.

▶ **Civil Flying**—This is aviation's shadowland, where a tremendous amount of flying is done each year, but little of it needs to be reported to any official or industry group. The Civil Aeronautics Administration has assembled some data, but the use of personal aircraft in business, for one example, is growing so fast that CAA's reports offer little help in forecasting.

Considering those factors, here's the way aviation looks in 1949:

USAF-Navy: $5.5 Billion

The way the government's fiscal 1950 budget (for the year beginning July 1, 1949) now is set up, the Air Force and Navy Bureau of Aeronautics will have $5.5 billion for procurement of aircraft and related items in the next three years. There is little likelihood of the present request being decreased, some chance of its being increased.

Better than half of that $5.5 billion

Aircraft Employment and Forecast*

	July 1944	December 1948	June 1949
Iowa	.....	1,100	1,100
Missouri	66,100	6,300	8,100
Kansas	45,200	10,500	12,500
Texas	67,600	19,600	23,700
California[1]	271,100	74,100	81,600
Washington	41,000	23,500	23,500
Connecticut	53,800	22,400	19,900
New York[2]	154,500	12,100	12,100
Massachusetts	.....	2,400	2,400
New Jersey	106,100	16,800	17,700
Pennsylvania	45,400	7,400	7,600
Maryland[3]	42,200	14,900	15,200
Ohio	138,600	9,100	9,200
Indiana	72,000	7,000	9,000
Total	**1,669,300**	**227,800**	**244,000**

***Total plant employment based on reports to U. S. Employment Service from plants employing 200 or more and devoting at least 50 percent of its production to aircraft (airframe, engines and engine parts, propellers and propeller parts and other parts).**
[1]Los Angeles and San Diego. [2]New York City and Buffalo.
[3]Baltimore and Hagerstown.

already is appropriated, either in cash or contract authorization—$3.2 billion not yet having been paid out. Danger of any of that money being rescinded is slight. That could happen if the international situation suddenly were stabilized on terms favorable to the U. S. and if a major business depression in this country made funds necessary for other purposes. Or it could happen if one or the other of those things occurred.

Military shipments in 1948 totaled 2400 planes of 25,143,500,000 airframe lb. Payments to military airframe contractors totaled about $800 million.

Forecast for 1949: 3000 planes, of 35 million airframe lb., and payments to military airframe contractors of $1 billion.

$1.4 Billion Gross

The $3.2 billion that the services already have available practically guarantees a large segment of aviation manufacturing a profit for the next two years. This year, total payments to manufacturers—for airframes and engines, from the military and from airlines and civil flyers—should be about $1.4 billion.

This level of payment would be about right to support a work force of 244,000, estimated for June of 1949. Payments aggregating that total could leave the manufacturers with somewhere around $200 million in operating profits. That statement, however, is subject to the qualification that partial payments sometime are not carried as sales until all deliveries are made.

This sum has no relation to expected deliveries. Government records show overall payments, not payments for specific airframes or engines. The prime manufacturer seldom knows what his plane—as delivered—is costing the government because of the government furnished equipment (GFE) paid for directly by the government.

For that reason, the backlogs reported by prime contractors (page 20) also bear no relation to the sums which the Air Force and Navy list as available for expenditure.

► **Commercial Business**—Only a small part of the total 1949 payments will come from commercial transports. In 1949, transport plane deliveries were:

Mo.	No.	Value
Jan.	13	$2,498,533
Feb.	14	3,994,084
Mar.	14	5,198,991
Apr.	16	5,401,869
May	34	15,819,336
June	33	13,066,634
July	17	6,078,713
Aug.	26	7,014,927
Sept.	21	6,771,307
Oct.	26	6,187,125
Nov.	23	5,493,383
Dec.	26	6,389,338
Totals ...	**263**	**$83,913,240**

Source: Bureau of Census

Forecast for 1949: 155 planes valued (with spares) at $120 million.

Among these planes should be all 55 of Boeing Airplane Co.'s Stratocruisers, and about 70 Convair-Liners.

Deliveries on this scale will leave the major transport manufacturers with nearly clean books as far as commercial business is concerned. But all four, Boeing, Douglas, Lockheed and Convair, will be turning out military versions of their transports.

► **Personal Planes**—Manufacturers of personal aircraft this year should be in a choice spot if present expectations are fulfilled. For the first time since 1946,

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Telephone: Millville 1750
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Bendix Eclipse
Jack and Heintz
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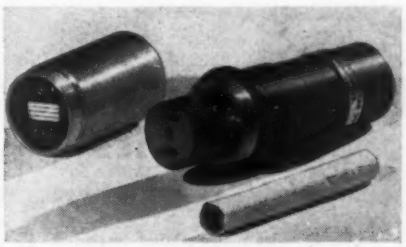
Champion Spark Plug
U. S. Rubber
Packard Cable
Titeflex, Inc.
Authorized major engine overhaul for Pratt & Whitney R-985—R-1340—R-1830—R-2000 and R-2800 series engines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G-MAX
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The G-WARNING* Indicator flashes a warning light when the aircraft approaches the design load limit to enable the pilot to take preventive action before hazardous acceleration loading is reached.
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These units can be installed readily in any type of airplane.
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Specify positive—quick connect—maintenance free—polyethylene insulated fittings and masts for maximum static reduction—low cost—manhour saving —tested and proven.

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HIGH PRESSURE PICKUPS
Strain gage type pressure gages in ranges to 5000 psi for use in red fuming nitric acid applications as well as non-corrosive liquids and gases—highest accuracies—full temperature compensation.

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Fredric Flader, Inc.
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JET ENGINE
ACCESSORIES

Giannini engine control accessories, designed for use with reaction powerplants, include automatic fuel metering units, automatic starting units, and fuel pump and drive systems.

Recently expanded manufacturing facilities afford firm delivery of 1949 improved instrument and powerplant equipment.

Latest Technical Catalogs on Request

G. M. Giannini & CO. INC
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NO FAST DEALS HERE!

In business more than a decade, Van Dusen Aircraft Supplies is solidly established, puts a greater value on its reputation for integrity than the profit of a "fast deal"

Van Dusen's honest, sincere, speedy service has done much to change the buying habits of those seeking the best aero supply service.

AIRLINES. 14 major airlines regularly buy from Van Dusen a wide variety of supplies from engine parts to cleaning materials — at the best possible prices with the fastest possible service.

EXPORT. Van Dusen's strategic location for fast shipment has resulted in mounting export business. Teterboro warehouse is convenient to air freight terminals and steamship docks. New York office, (51 Madison Ave.) expedites orders.

DEALERS. Over 700 airport service operators have found Van Dusen a good outfit to deal with for all their supply needs. VDAS field sales and service personnel assure maximum satisfaction.

For all the right products at the right prices try Van Dusen and see the difference.

Van Dusen AIRCRAFT SUPPLIES
MINNEAPOLIS
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their sales will not take a big drop. In 1948, deliveries of personal aircraft were:

Mo.	No.	Value
Jan.	449	$2,018,069
Feb.	447	2,215,996
Mar.	564	2,491,739
Apr.	750	3,028,139
May	778	3,164,874
June	926	3,783,096
July	903	3,432,040
Aug.	674	2,854,639
Sept.	569	2,683,630
Oct.	476	2,219,670
Nov.	294	1,384,858
Dec.	210	1,107,600
Totals	7040	$30,294,350

Source: Bureau of Census

More than one-half of total shipments, or 3796, were three-place and larger planes.

Forecast for 1949: 6000 planes valued at about $30 million at the plants (selling at dealers for about $37 million). Four-place planes should total about 3600, two-place about 2400.

This, on the surface, is a sizable drop in numbers from 1948 shipments, but the estimated value would be about the same as last year. The calculated volume is conservative, and the gap between 1948 and 1949 units sold could be very much narrower.

► **Engines**—Jet engine production is widening. Last year three manufacturers were in quantity production; this year one and possibly two more will reach that stage. Production, 1948:

Mo.	Horsepower	Value
Jan.	896,570	$23,675,922
Feb.	1,200,800	25,958,747
Mar.	1,400,085	30,157,553
Apr.	1,668,030	31,121,882
May	1,725,880	30,570,757
June	2,030,060	21,813,029
July	2,413,250	13,090,571
Aug.	1,746,010	3,649,391
Sept.	2,636,326	4,458,890
Oct.	2,574,258	2,618,739
Nov.	2,544,604	3,319,463
Dec.	2,565,314	3,429,824
Totals	23,401,187	$193,875,768

Note: Jan.-May airframe weight for military only; Aug.-Dec. value for civil only. Source: Bureau of Census and National Defense Dept.

Forecast for 1949: Total horsepower, 40-45 million, valued at about $400 million.

Airlines: $635 Million

Revenue passenger miles of the certificated scheduled airlines should turn upward this year, after a slight drop in 1948. Converting this outlook into a projection of revenue is difficult. There is no longer a standard airline fare. It varies according to the type of equipment flown, the day of the week on

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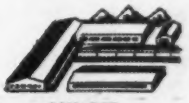
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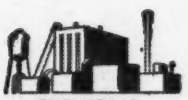
CHEMICALS

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Half the melting stock used in a steel mill or iron foundry consists of scrap.

In normal times, enough scrap is produced by the mills, foundries, railroads, scrap dealers and fabricators to fill the need.

But although the mills are now working at capacity, the greatly increased demand for steel and castings has outstepped the supply of the heavy scrap that makes the best steel—and at the fastest rate.

The quickest way to increase the production of steel and castings is to increase the supply of heavy scrap.

That is why we are calling on plants in NON-METALWORKING industries to provide the needed heavy scrap NOW.

One million extra tons are needed!

You Have the Heavy Scrap Needed to Make More Steel

Enough obsolete machinery, equipment and parts are being carried as useless inventory in *non*-metalworking plants to give a big push to the production of steel. Surveys have proved this.

The trick is to get that old iron and steel into the hands of the steel producers and foundries.

We're putting that job up to *you*.

To help increase steel production . . . provide more steel for fabricating the equipment you want . . . *to build an emergency reserve for national security* . . . turn in your useless heavy scrap to your local scrap dealer.

What You Can Do to Help Step Up Steel Production

1. Appoint one top official in your plant to take full responsibility for surveying the plant and getting out the heavy scrap.
2. Consult with your trade association's Scrap Drive Committee about its program to help the scrap drive.
3. Call on your local scrap dealer to help you work out a practical scrapping program.

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* * *

EXHIBIT SPACE

Due to the many requests received during recent years for static exhibits, this year the management is considering making available an exhibit area within a building in the center of the Air Race grounds.

FOREIGN DELEGATES

This year, representatives from over 20 foreign nations will attend the Races as delegates to the Federation Aeronautique Internationale Conferences to be held in Cleveland.
Any companies interested in securing space for this 3 day period are requested to mail in the attached coupon.

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is interested in the possibility of securing approximately.....square feet of exhibit space for the period Sept. 3-5

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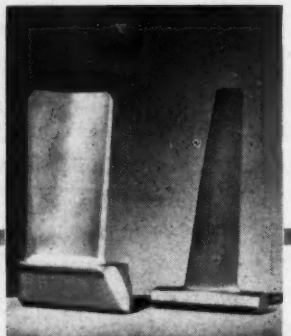

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which a passenger makes his flight, and the number of people in his party.

This situation arose out of two factors: the insistence of several of the major airlines and CAB that fares be raised, and the parallel pressure from travelers for low fares.

Late in 1948 major carriers agreed to raise fares, then promptly started whittling away at them with special promotional rates. Consequently, in 1949 revenue passenger miles can increase, without a like increase in passenger revenue. In effect, it will be a race between miles and fares. If revenue miles increase fast enough they could wipe out the lower fare handicap.

In 1948, certificated domestic trunklines flew about 5,800 million revenue passenger miles; feeder lines about 88 million, and international lines about 1,885 million. Total operating income for trunk, feeder and international carriers was approximately $643 million.

Forecast for 1949: Total revenue passenger miles for trunk, feeder and international lines, 8,550 million. Total revenue from passengers, cargo and mail, $635 million.

That revenue figure could slide up another $15 million with increased mail rates, higher cargo revenue and an increase in passenger revenue instead of the anticipated decrease. The two most likely are the mail and cargo increases.

► **Cargo**—The trend in air cargo is away from the independent lines that pioneered big-time cargo operations. Scheduled airlines did not even figure materially in the cargo picture until the middle of 1947. Last year, the independents, such as Slick Airways and the Flying Tiger Line, still carried more cargo than any of the scheduled lines. But several of the scheduled carriers were making larger gains than any of the independents. American Airlines, in particular, has been concentrating on this field and in 1949 could be the leader.

Scheduled and independents together in 1948 flew about 125 million ton miles. Scheduled carriers flew approximately 72 million ton miles. Only two years ago, independents flew about 60 million ton miles a year, against the scheduled lines' 40 million.

Internationally, it is much the same story. Seaboard & Western Airlines, contract carrier operating only internationally, still flies more freight than any scheduled carrier. But TWA and Pan American Airways are coming up fast.

► **Equipment**—One factor in the increased concentration of scheduled lines on cargo is the equipment situation. Immediately after the war, the scheduled lines, preoccupied with meeting what appeared to be a tremendous air travel demand, threw every available

plane into passenger service. Then newer planes began going into operation. Passenger planes superseded by the newer equipment have been put to work hauling cargo.

Nearly as many DC-4s as DC-3s have been replaced in passenger service by the Convair-Liners, DC-6s and Constellations. Most of the DC-3s have been put up for sale. But the DC-4s have gone into cargo service. Although it was not built especially for cargo use, the DC-4 has done a good job. The clamor of six months or a year ago for a new cargo plane is not heard so often now from the airlines.

A new, specially-designed cargo plane would cost between $600,000 and $1 million. The airlines, just beginning to straighten out their finances, are not too much interested in new cargo equipment when they have spare DC-4s which, while not as efficient as a specially-designed cargo plane, still can make money at present cargo rates.

Should Congress enact some form of legislation to aid the development of commercial cargo planes, airline interest will reawaken. But if that does not happen this year, it is doubtful if the airlines will plunge into any program for new cargo equipment.

▶ **Passenger Traffic**—Air coach service is the key to the scheduled airlines' future. All first-class travel slowly is declining, rail and air. A business depression this year would accelerate that trend. The question the airlines ponder is: how much would bad business conditions decrease revenue passenger miles if air coach service were widely available?

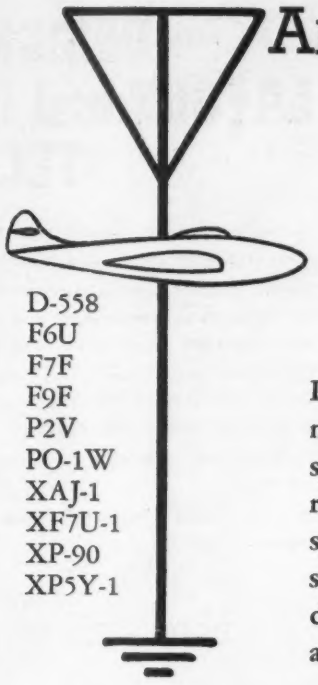
Many observers think a depression would boost passenger miles if widespread coach service were available. The time-saving would cut a business man's expenses for hotel, meals, etc.

Coach service portends the industry's future in another way. Scheduled domestic coach service up to now has been operated in off-hours. One airline only now is beginning to run air coaches over a long-haul route. The airlines have fought for rights to morning and evening departures, and long-haul service. That is where they have believed the major revenue lies.

Coach service domestically will get its biggest test when the airlines begin operating it over their choice long-distance routes at their choice departure times. That should happen this year. It will be an economic test more than a weighing of the popularity of air travel.

If the airlines can sell comfortable—although frill-less—air travel cheaply, and still cut costs enough to make a profit at about 4 cents a mile, they are on the doorstep of a new era of expansion. They should find out in 1949.

▶ **Atlantic Traffic**—The core around



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which all projections of future Atlantic air travel must be spun is that foreign airlines are getting a greater share of the available traffic. That situation developed in 1948; it will continue this year.

The fact that foreign airlines are increasing their share of air travel across the North Atlantic will dominate the CAB hearings on the proposed purchase of American Overseas Airlines by Pan American Airways. The decision in 1949 on that case will shape the future of Atlantic air travel.

Helicopters: Sales Peak

As far as can be determined, 1947 was the best year to date for commercial helicopter sales, with between 125-150 delivered by the only two manufacturers, Bell and Sikorsky, with certificated machines. Now another firm has received a certificate for a helicopter. Less than 100 helicopters were delivered in 1948.

Forecast for 1949: 150-175 helicopters delivered.

As pointed out on page 101 by L. Welch Pogue, the helicopter has proved its utility. Until this year it has not proved its saleability. The reason has been cost—both purchase price and operating expense.

The favorable sign in the helicopter industry for 1949 is that prices are being lowered. United Helicopters on the West Coast—the third company to receive a certificate for a rotorcraft—has gone into production of a two-place industrial model selling for $19,995. UH proposes to manufacture 100-200 machines this year and next. It believes it can see a market for at least that number.

A perhaps more significant development is Bell Aircraft's pricing of a new model at $23,500—after having raised the price of a similar machine from $25,000 to $39,500. Bell, the first company to receive a helicopter certificate, has been a leading producer.

A fourth company, Kaman Aircraft, will receive a certificate this year on an industrial helicopter which will sell for $20,000 or less. This company claims it already has in sight 50 sales for this year.

The amount of helicopter development activity (list, page 102), in view of the poor sales results to dates, is amazing. In 1949 the versatile machine will go on the market priced to stir up volume. Because of that, helicopter sales in 1949 could tell the future of commercial helicopter development.

If the optimism of the three existing producers, plus Kaman, is well founded, helicopter development will expand. If not, the list of helicopters next year will be smaller.—**W.K.**

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(Continued on page 136)

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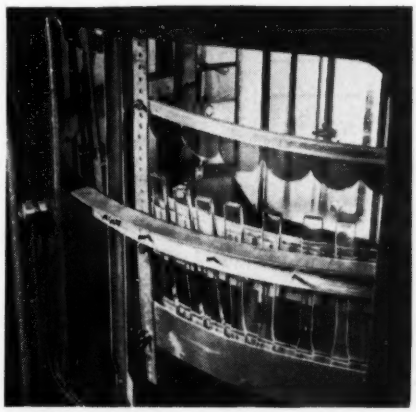

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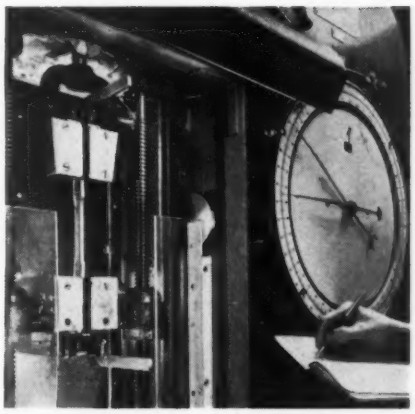

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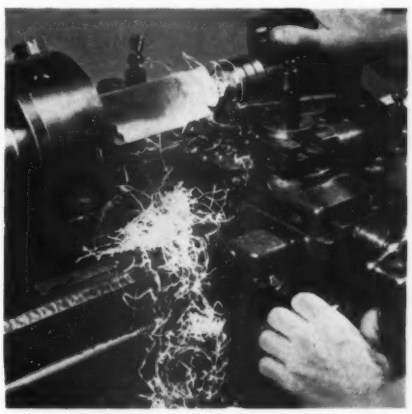

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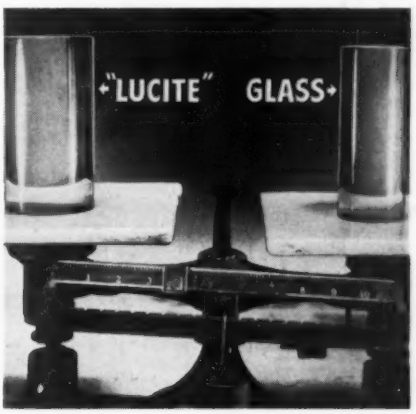

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